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Seawall of Novel Design for Seattle Waterfront . . . Mercury-Vapor Power Plant of All-Welded Construction . . . Relocating the Boston-Concord Road . . . Welded Arch Bridge of 166-Foot Span . . . Recent Advances in Soil-Testing Methods

Engineering News-Record

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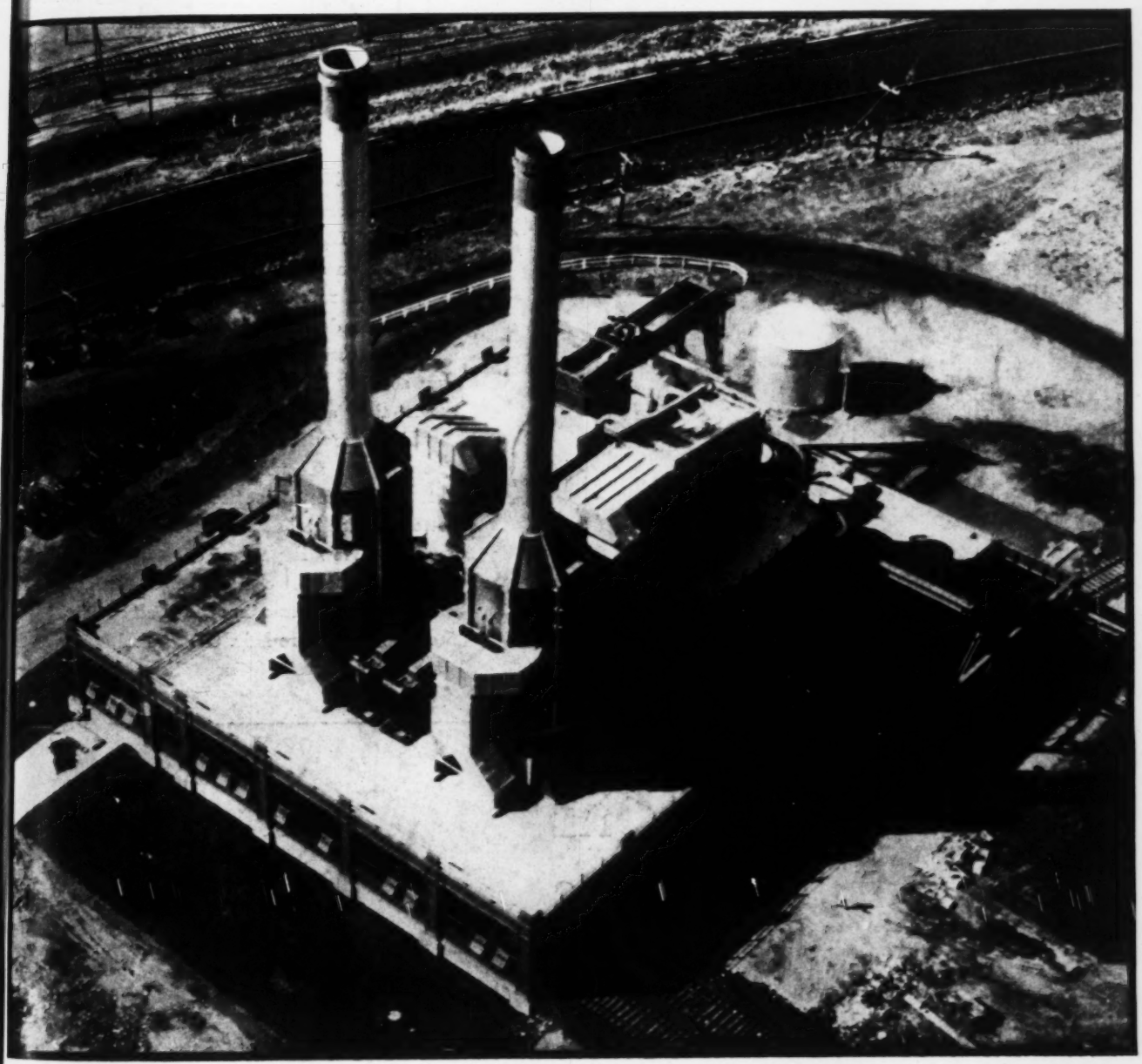
November 8, 1934



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From Relief to Recovery

BEFORE the printer could get into type the contents of this page for last week's issue, the daily press offered another striking example of the misunderstanding therein noted between public relief and the public works recovery program.

In an interview published in the New York Times, Myron C. Taylor, Chairman of the Board of the United States Steel Corporation, asks private aid to supplement the relief efforts of the government. His appeal on this score is sound in substance and admirable in expression.

He points out what "four years of enforced idleness can do to a man—four years of spiritual, mental and economic stress." He pays tribute to those characteristics of our people that have contributed so largely to our national progress, "above all, their sense of self-respect." He reminds us that public relief "tends to be a 'hand-out' and that those who receive it are having their characters undermined." He distinguishes between government "work" relief and "home" relief. "Work relief," he tells us, "is an attempt to allow the unemployed to maintain their self-respect *by giving them nominal wages in return for work on projects not competing with normal business activities.*" The italics are by this writer. They are intended to make clear that Mr. Taylor's very correct understanding of what constitutes "work *relief*" cannot comprehend a public works project, when administered through the normal processes of handling public construction contracts.

Surely that is no matter of "giving them nominal wages" or of having to seek out projects "not competing with normal business activities." Quite to the contrary, the wages paid on normal public works projects would be identical with those that prevail in private business and the production of the necessary materials and equipment would, for the time being, provide a substantial share of all the business and employment available to certain industries.

Yet, alas, when Mr. Taylor lists the various relief and charitable agencies, he falls into the common error of including the PWA. After listing, in addition, the CCC, the FERA, state relief administrations, city relief administrations and private charities, he comments that the average citizen does not realize the relative significance of each. The unfortunate fact is that this lack of understanding is not limited to the average citizen. It prevails elsewhere, even with some of those in official positions, who have handicapped the PWA recovery program by perverting it to relief purposes.

All the unfortunate aspects of public relief, so well described by Mr. Taylor, have been cited by this journal for several years past in the course of its efforts for a sound public works program and procedure. Today the need is just as real as ever and our reports indicate the probability that it will be recognized in the President's forthcoming program. The administration, we are told, feels that large-scale relief expenditures must be ended as quickly as possible, and that the most available source of large-scale *employment* is construction. Granting always the substantial possibilities of a housing program, public works still offer the most available means for starting such an effort.

With a continued public works program in prospect, it is well to restate certain conditions that must be met if we are to realize its full value. In the first place, it should be administered with no taint of relief, either as to purpose or in practice. *Normal processes and channels should be employed to plan and carry on the work.* To foster employment by private industry, the employment of day-labor by governmental agencies must be reduced to a minimum. The program should be projected for three to five years so that an assurance of continuity will warrant forward commitments and investment by the heavy industries that would benefit by such activity.

Such a program, generally endorsed by the business and financial interests of the country, would give a real impetus to the heavy industries; and long before it could be carried to its projected extent, a revival of private enterprise probably would justify its gradual reduction.

Willard Chevalier

ENGINEERING NEWS-RECORD

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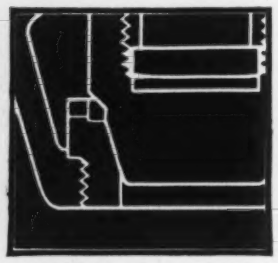

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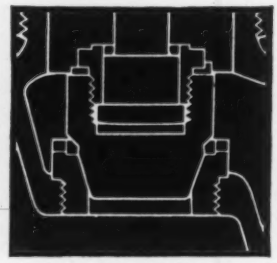

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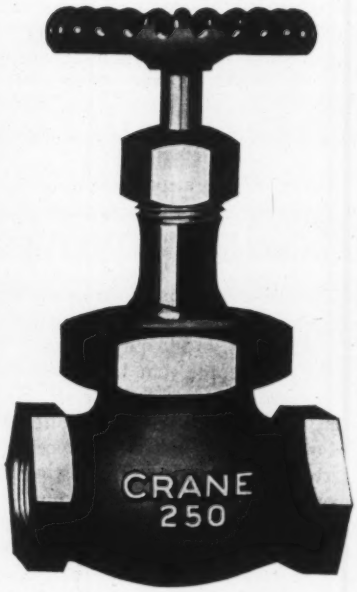

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In the News:

WORK INAUGURATED in New York last Saturday looks forward to the first visit of the super-liners "Queen Mary" of Great Britain and "Normandie" of France. It involves erection of steel sheds over the three 1,000-ft. piers completed this year on the Hudson River waterfront. Built and owned by the city, the piers have been leased to the Cunard-White Star, the French and the Italian steamship lines respectively.

INAUGURATION of Title II of the National Housing Act last week sets in motion machinery for new house building (and perhaps limited-dividend apartment buildings), which will benefit from lower financing charges and long-term insured mortgages. With considerable elation Administrator Moffet announced that two such powerful financial institutions as the Riggs National Bank, of Washington, D. C., and the Guaranty Trust Co. of New York were applicants No. 1 and No. 2 for mortgage insurance.

IN THE INTEREST of the 400 men employed on the work, the PWA has receded from its imperative demand for the termination of the Philadelphia subway contract, on condition that all defective work will be repaired and PWA labor and wage regulations corrected.

THE CONFUSION caused by overlap in the matter of assessment payments under the various divisions of the construction code will be aired at a public hearing scheduled for Nov. 15 in Washington.

INSPECTION of the facing stone on the Washington Monument shows considerable cracking which has been attributed to lightning, sway from wind and expansion from the sun's heat.

NEGOTIATIONS for the first and only PWA project to be financed through a leasing plan of reimbursement to the government have been completed with the state of Georgia, and bids will be called soon for the state prison to be built with this loan.

In This Issue:

TO IMPROVE the thoroughfare approach to harborfront facilities, the city of Seattle is building a 6,100-ft. seawall of unusual design. Precast concrete slabs and steel sheetpiling on the front face and a relieving platform with timber caps, designed to transmit tension from the wall to the timber bearing piles, are features of the design. Construction sequence is also reviewed.

A FIFTEEN-MILE trunk-highway relocation from Boston to Concord is described to illustrate present main-route construction in Massachusetts and particularly the careful detail of construction required for both bituminous and concrete surfacing.

THE FIRST all-welded steel-arch bridge, a 166-ft.-span highway structure, has been completed in Czechoslovakia.

ANOTHER INSTALLMENT on "Advice for Contractors Entering Government Work" emphasizes the importance of knowing the wording of the contract, which is a most inflexible document.

A THOROUGHLY UNIQUE STRUCTURE is the mercury-steam-electric power plant built by the General Electric Co. at Schenectady, N. Y. Carrying functionalism in building design to a new high, it consists of the necessary equipment and a minimum of enclosure. It has been called an "outdoor" plant. Completely arc-welded, with some very heavy structural work, the plant also records advance in this branch of engineering.

WHAT HAVE the soil physicists in their extensive and often highly theoretical studies unearthed that has immediate practical application? An interview with C. A. Hogentogler and A. M. Wintermyer, of the Bureau of Public Roads, records the developments in soil-testing methods that have proved useful, including descriptions of the equipment necessary for determining characteristics of soils.

FOLLOWING the brief announcement in last week's news pages, the engineering board's report on the Twin City sewage-treatment plan is abstracted, to indicate the recommendations that are now up for "comment and advice."

A Special Number

THE MAJOR PART of the issue of Nov. 29 is to be given over to a group of articles on the economic aspects of the great power, navigation, and irrigation projects now under construction by the federal government: Grand Coulee and Bonneville dams on the Columbia River, Boulder and Parker dams on the Colorado, Alcova and Seminoe dams on the North Platte River, Fort Peck Dam on the Missouri River and Norris and Joe Wheeler dams in the Tennessee Valley. These projects are entirely outside the normal navigation and irrigation work planned for and built by the Corps of Engineers and the Bureau of Reclamation.

The purpose of the articles is to set forth why each project was undertaken, to show whether or not each project fits into the orderly development of the river upon which it is located, and how each project, or group of projects, is related to the development of the natural resources of the region in which it is located. Special attention will be given to the economic justification or lack of justification of the projects and to their effectiveness as work-producing operations under the Recovery Act.

Bright and lasting floors - of fine terrazzo

This Atlas White terrazzo floor is in the lobby of the Broadway Theatre, Palmyra, N. J. John DiSopra was the terrazzo contractor. David Supowitz was the architect. Both of Philadelphia.

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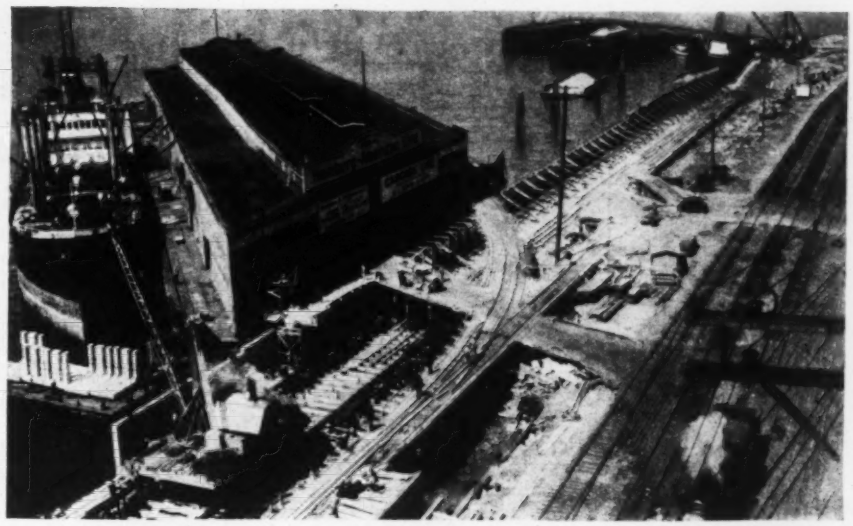


FIG. 1—MODERNIZING the Seattle harbor front with a seawall of precast concrete slabs. A pile-supported relieving platform carries the fill on which the railroad tracks are rebuilt.

Seawall of Novel Design for Seattle Waterfront

Important municipal improvement on Railroad Ave. has facing of precast concrete slabs with sheetpiling cutoff beneath—Heavy thrust transmitted to timber caps—Railroad tracks supported on fill over relieving platform

RAILROAD AVE., the principal waterfront street in Seattle, provides both rail and vehicular access to piers and the adjoining wholesale business district. Railroads entering the city from the north originally built their main lines along the waterfront and still retain freight-service connections within the boundaries of Railroad Ave., which is 150 ft. wide. Beneath the street level and along the pile trestles that carry street traffic and tracks over the beach areas there has been gradual filling in of sawmill refuse, broken concrete and driftwood. The need for a modern type of seawall construction along this harbor front thoroughfare has been recognized as a desirable improvement for more than twenty years; a deterrent factor has been the high cost entailed by the physical problems of soft bottom and a 16-ft. tide range, with the attendant marine-borer menace to timber construction.

In 1929 new franchise agreements with the railroad companies restricted through trackage to the easterly side of the street, leaving only spur connections to the piers across the main roadway, and marked the start of a definite solution of the unusual problem. A novel design for a seawall developed to fit Railroad Ave. requirements was finally adopted, and late last year funds were made available. Construction, in accordance with the design described in the following, now is well under way.

Primary objectives of the design were to take care of a heavy horizontal thrust figured at 12,000 lb. per lin.-ft.

FOR MANY YEARS Seattle has recognized the need for improving its main harbor front thoroughfare. Railroad Ave. has been a confusion of railroad tracks and trucking area supported on timber-trestle construction, and the transfer facilities between the pier sheds and the wholesale district have been seriously hampered. No temporary expedient was feasible, and a major reconstruction program on this waterfront, with its soft foundation and 16-ft. tide range, was essential to modernize the harbor line, which is one of the most important assets of the city. For several years the project was delayed because of financing problems, which included the allocating of costs among railroads, special assessment districts and general city obligations. These problems have been settled, and the work is now well under way. This article describes the general design and construction features of the work, and the succeeding article reviews the details of the important work of precasting the concrete slabs that are exposed to sea water. —EDITOR.

of all for one type of design and 38,000 lb. per lin.-ft. for two other designs, without making use of a gravity-section retaining wall, which, if built on piles driven into the soft subsoil along the shore, might be in danger of moving off into deep water. It was highly desirable to have the upper part of the construction in the form of earthfill to facilitate changes in spur-track locations, which doubtless will become necessary as future improvements are made in track facilities to and on the piers.

These objectives were accomplished by a design that includes: (1) steel sheetpiling along the line of the wall face; (2) vertical and batter timber bearing piles behind this sheetpiling to support a timber relieving platform; (3) precast concrete slabs on the water edge of this platform, set vertically to form the face of the seawall, the slabs making a tight connection with the sheet piling by means of concrete placed around the joint; and (4) a means for anchoring these precast slabs by bonding them at the level of the center of thrust to timber caps extending back in the relieving platform to connect with the pile heads, these caps to transmit into the piles the horizontal thrust for which the seawall is designed. Obviously, these requirements called for a precast slab of unusual form, as well as novel features in the connections between steel and concrete and the concrete and timber.

Because of the difficulty experienced by contractors in disposing of local improvement district bonds offered in partial payment for the work, also because of wide differences of opinion as to the cost and feasibility of successfully carrying out the novel design, there was much delay between completion of plans and start of the work. Bids on the job as a whole were invited several times without attracting a single tender. It became apparent, therefore, that if the construction were to be undertaken, it would have to be handled by the city itself on its own financial, engineering and construction responsibility. The city then assumed the function of general contractor and let subcontracts for parts of the work that were readily handled separately. The first slab was placed May 16, 1934, and on Sept. 1 slabs making up a length of 1,746 ft. of the seawall were in place.

Project as a whole

The seawall's total length of about 6,100 ft. is made up of three variations of the general design, designated A, B and C. About 5,000 ft. of type A design (Fig. 3) will be used along the beach where the ground line does not go below El. -15. For this part of the work the precast concrete slabs have a section resembling the letter T lying on its side. The B type, designed for a steeper beach slope where the ground level varies from El. -20 to El. -40, has an L-shaped section (detail on Fig. 4); about 800 ft. of this type will be required. The C type, of which there is only about 300 lin.-ft., also makes use of the L-shaped slabs but has, in addition to batter piles driven with forward slope, an auxiliary system of batter piles with backward slope. By means of hooped connections over the timber ties in the relieving platform, these batter piles are to resist overturning moment in the wall itself by carrying a tension load.

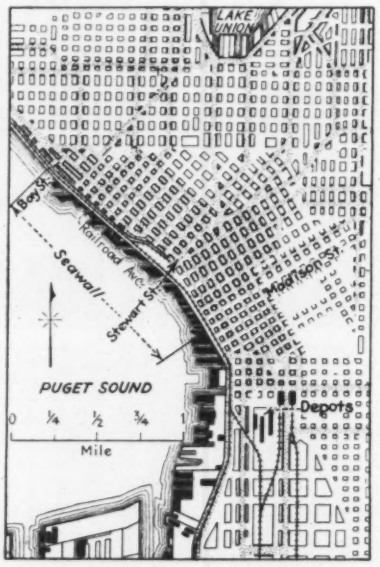


FIG. 2—SEAWALL LOCATION with respect to the principal harbor-front and business section of Seattle.

All three types have the same design in timbers and flooring, which constitute the relieving platform, the differences being chiefly in the shape of the concrete slabs, the height of sheetpiling, the use of wooden batter piles under the platform, and the concrete protection of sheetpiling required for B and C types. In these two types the steel sheetpiling comes up nearly to the level of the relieving platform and would be exposed to tidal action if unprotected. The change from B to the C type is made where the water depth and beach slope are such that the compression batter piles cannot be counted on to carry the overturning moment with sufficient margin.

Piles and relieving platform

The plan for types A and B is to use piles just long enough to penetrate the mud and debris on the beach and enter a layer of compacted sand and gravel, which usually occurs at El. -35 to -40. However, for that part of the wall where Type C design is used, this compacted layer was found to be only 4 or 5 ft. thick, and below it lay some 40 or 50 ft. of fine sand and fresh water highly deficient in supporting power. The risk of breaking this crust over the fine material by the deposition of a considerable weight led to the decision to use longer piles and to go through to a firm layer below. Accordingly, piles that occasionally exceed 110 ft. in length are used here. This form of support was found cheaper than a design using 130-ft. steel cylinders of corresponding load capacity, as at first proposed.

The total width of the relieving platform for the A-type construction is 47

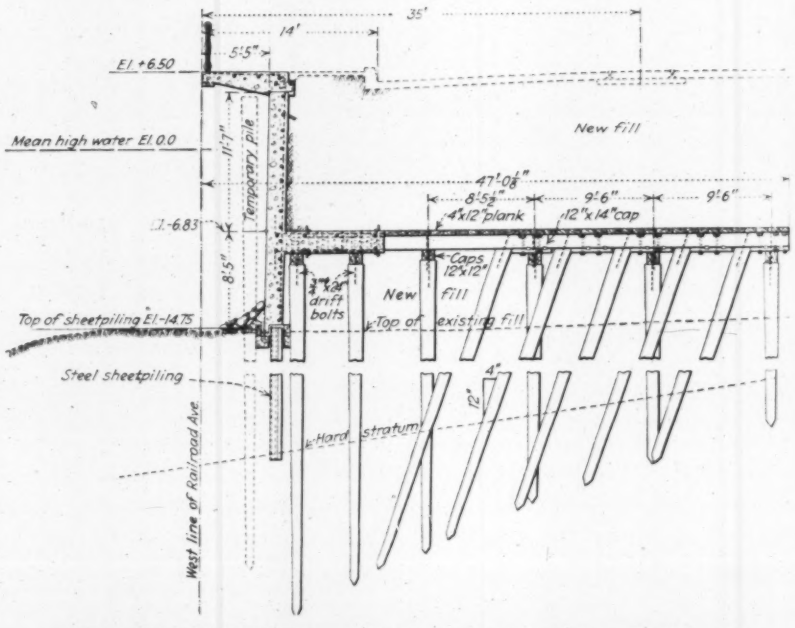


FIG. 3—TYPICAL SECTION through seawall showing pile supports, precast concrete slabs and new fill area. This type A section was used for about 5,000 ft. out of the 6,100-ft. total length. The slab for type B section is shown in Fig. 4, and type C is characterized by extra long piling battered in both directions.

ft. (Fig. 3); inshore from this an ordinary fill will be used. Calculation of the horizontal thrust was based on four components: (1) a surcharge loading of 500 lb. per sq.ft. above the roadway surface; (2) 9 ft. of sandfill with an angle of repose of 2:1; (3) 14 ft. of saturated fill weighing 112 lb. per cu.ft. with a 3:1 angle of repose; and (4) a submerged fill weighing 70 lb. per cu.ft. with a 3:1 angle of repose. From these four the total horizontal thrust against the seawall was calcuated as 12,000 lb. per lin.-ft. of wall.

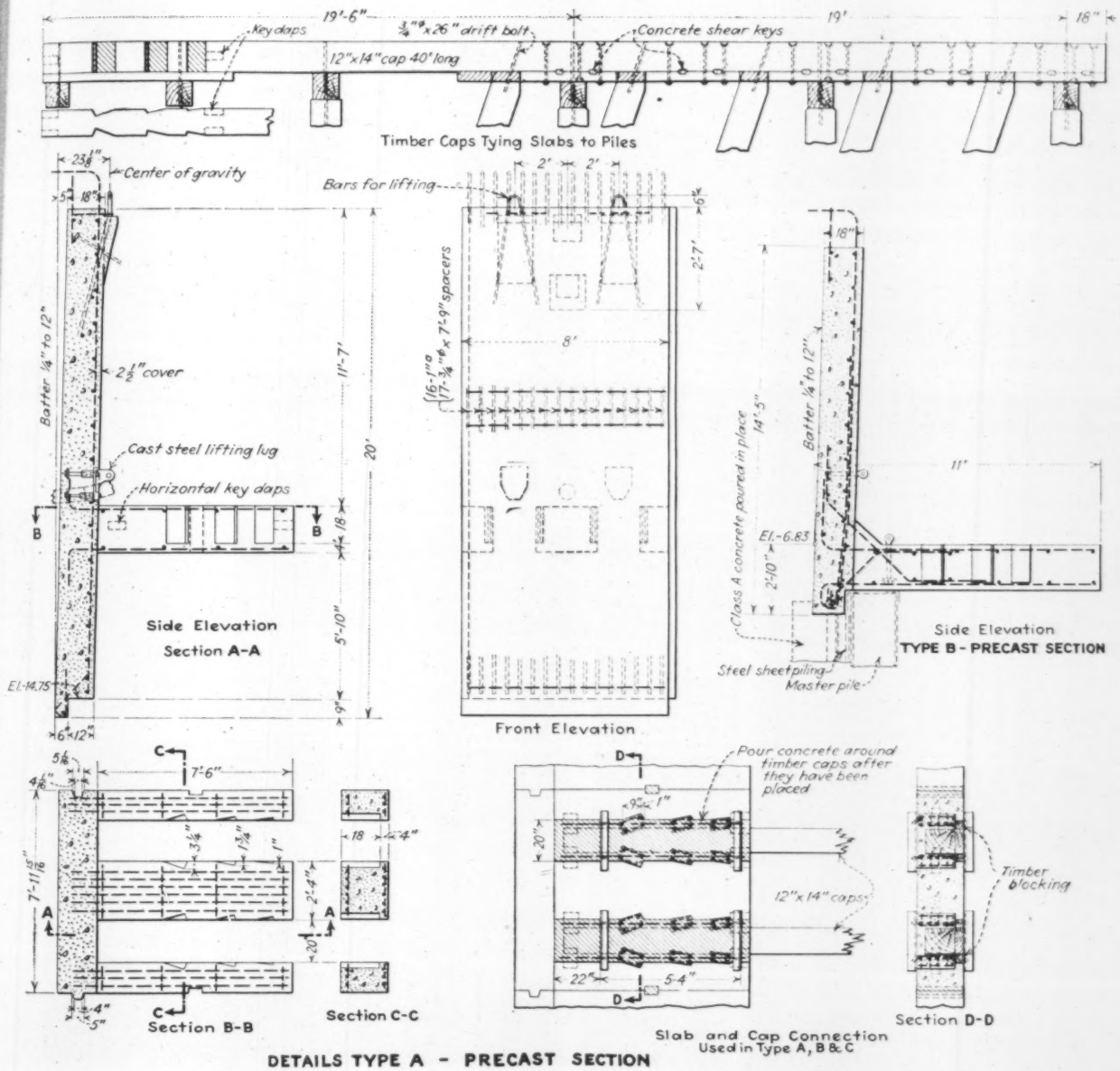
On this basis the thrust against an 8-ft. length of the seawall (the precast slabs are of this width) would be 96,000 lb. The design of the slabs was worked out to transfer this thrust into tension to be taken by two 12x14-in. timbers 40 ft. long whose ends would be notched and embedded in the concrete of the horizontal leg of the slab (Fig. 4).

In the case of some of the B and C-type sections of the wall, the horizontal thrust is calculated to be as much as 38,000 lb. per lin.-ft., because of the increased depth of the water on the seaward side. To provide a sufficient anchorage to allow for possible future dredging in front and future strengthening of type A wall, the notches in all timbers were cut large enough to carry this greater load. The notching was arranged to transmit the total load to the timbers without developing excessive stress in the timbers, either in shear or in tension.

FIG. 4—SLAB DETAILS of type A wall slabs, timber caps and method of connection. A section of the type B slab is shown to indicate the difference in design.

In the slabs of the type A wall, the joint between concrete and the steel sheetpiling is made by building up a timber form around the top of the sheeting, in which concrete can be placed (using tremies when necessary) either just before or after setting the slab. The weight of the precast slab is carried entirely by the timber piling and caps of the relieving platform, which engage the under side of the horizontal leg of the slabs.

The steel sheetpiling, driven after the relieving platform has provided convenient support for the driver, varies in length from 15 to 60 ft. Its function is to retain the soft material underlying the old beach and the new filling material up to the bottom of the relieving platform, so that there will be no seaward movement of underlying material



DETAILS TYPE A - PRECAST SECTION

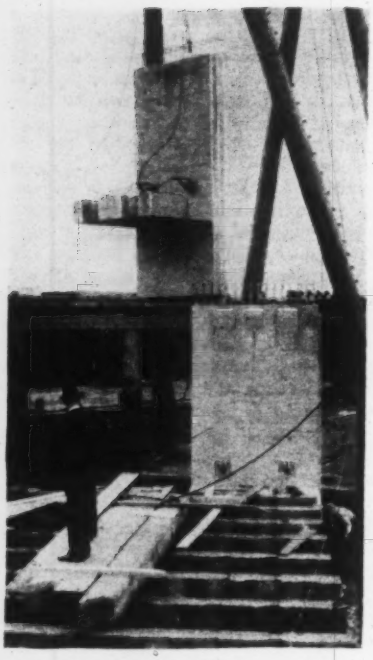


FIG. 5—PLACING SLABS with lines attached to loops of reinforcing steel in upper edge. Note slack lines attached to lugs at horizontal center of gravity, used for picking up.

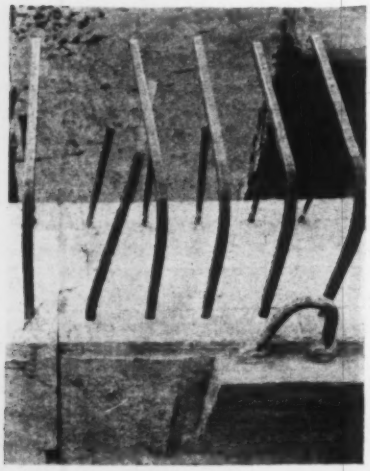


FIG. 6—SLAB JOINT visible at top of wall. U-bolts used for vertical lifts are shown. Projecting reinforcing will support sidewalks to be cast in place.

with the consequent possibility of exposure of the untreated timberwork to attack by marine borers.

Under types B and C walls it is necessary to retain a considerable depth of fill, and the sheetpiling is reinforced with master piles consisting of 22-in. beams of the proper weight to withstand the bending moments developed at the various points.

The relieving platform, complete with its supports and the notched timber caps, is in place before the concrete slabs are set. The timber caps, which are drift-bolted to the tops of the bearing piles, have to be in exact position both as to line and grade because they fit into openings left in the horizontal leg of the precast concrete slabs. On the other hand, the piles that support the caps cannot be exactly placed because of irregularities and deflections that result from driving through old fills containing numerous obstructions. Therefore, the piles are driven as accurately as is consistent with reasonable speed, and after they are cut off to exact grade a survey of their locations is made with a transit. Based on this survey, each cap is framed and marked for a particular location. Where pile heads are off-center sufficiently to warrant such treatment, a short length of 4x12-in. timber is bolted to the side of the cap to widen it where the pile is out of line, affording a full bearing despite the misalignment.

Four-inch timber blocks bolted to the under side of the caps are placed to fit exactly behind the tops of the batter piles. Thus, when the cap is laid down upon the pile tops, every pile, whether vertical or battered, comes into bearing. In addition to the bolts put through these scabs on side and bottom of the caps, sliding movement between scab and timber is resisted further by keys of cement mortar.

When the caps are in place with full bearing on both the vertical and the batter piles, and bolted fast, the structure is ready for the precast slabs. The slabs are brought to the job by rail or barge, loaded face down. Two sets of pick-up bolts are provided on each slab—i.e., one set over the center of gravity when the slab is lying on its face and another over the center of gravity when the slab hangs vertically.

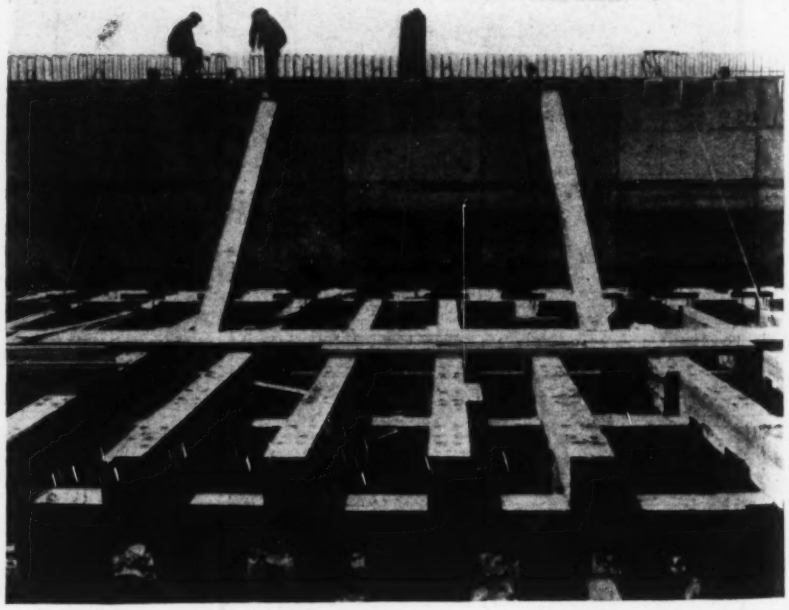
Picked up from the barge by an A-frame derrick, using one set of pick-up bolts, the slab is swung into position over the wall; support is transferred to the other bolts (Fig. 5) by tightening up on cables to the second pair of connections, and the slab is lowered vertically into place. The bolts used in lifting it from the horizontal position are temporary fastenings bolted into a recess in the slab left for this purpose. These bolts are removed after the section is in place and are used again. The points of attachment for the vertical position are U-bolts permanently embedded in the top of the slab.

After each slab is set in the fresh concrete over the sheetpiling, the slab is braced by steel tierod or inclined timber strut (Fig. 7, to hold it in alignment. A rich cement mortar is then placed in the notched space between the heads of the timber caps and the sides of the space provided in the precast slabs. The vertical joint between the slabs (Fig. 6) has been so tight that it has not been necessary to seal at the back as had been planned.

The final step in making the slabs into a continuous seawall is the pouring of the cantilever sidewalk carried on reinforcing bars left extending from the slabs for this purpose. This is not done, however, until several hundred feet of wall are completed and the fill has been placed, so that any small movements attendant upon the filling operations will have occurred.

Material for filling both above and below the relieving platform is delivered on barges and unloaded by grab buckets that dump onto the platform. Alternate planks of this platform are omitted to facilitate getting the fill material beneath

FIG. 7—SLABS IN PLACE, viewed from the land side. The inclined timbers and tierods are removed after the concrete around the timber caps has set. Note the timber scabs over misaligned piles.



it, and sluicing jets are used to aid in the placement. Material is worked into the space just behind the concrete slabs and beneath their horizontal portion by jetting down through 4x6-in. holes left at 8-ft. intervals at about the center of the slab, and 4x12-in. holes left at about 4-ft. intervals immediately opposite the ends of the timber shear caps.

The estimated total cost of the Railroad Ave. improvement is $1,396,000, and construction is expected to require about two years. Principal contractors, all Seattle firms, are as follows: Driving timber piles, Manson Construction and Engineering Co.; furnishing precast concrete sections, General Construction Co.; placing concrete sections, Hagman & Larsen, Inc.; placing filling material, Western Construction Co.

The work is being done according to designs developed by Clark H. Eldridge, city bridge engineer, who is in direct charge of the work. R. R. Hubbard is resident engineer on the job, and Thomas R. Beeman is city engineer. W. F. Way, as consulting engineer, reviewed the design.

Precast Slabs of Dense Concrete for Harbor Seawall

Concrete for Seattle waterfront improvement shows strength as high as 7,800 lb. per sq. in.—Slabs cast face downward and vibrated thoroughly

IN THE PRECAST SLABS for the Railroad Ave., seawall in Seattle, one of the principal requirements was to secure concrete that would be highly resistant to salt water, particularly on the face exposed to constant tidal action. The slabs are 18 in. thick, and each has a 12x20-ft. face exposed to seawater. Their design was purposely worked out so that the effective location for the steel reinforcing would be toward the rear of the slab, giving a maximum concrete cover between steel and seawater. The slab-construction plan provides for pouring the slabs in a casting yard with the face downward, so that gravity and vibration can be combined to bring cement to the front surface and secure maximum density there. General features of the design and plan of constructing the seawall are described in the preceding article.

A section through the seawall shows the precast slabs of type A construction in the shape of a letter T lying on its side—that is, with the top of the T in the vertical plane where tidal action occurs. The casting is done, however, with the T in an inverted position and with the bottom of the form against the face of the slab that will be exposed to seawater. For part of the work in which an I-shaped section is used the same general casting plan is followed. Sections, heavily reinforced with 1¼-in. deformed squares, weigh about 24 tons for type A, 21 tons for B and 20 tons for type C.

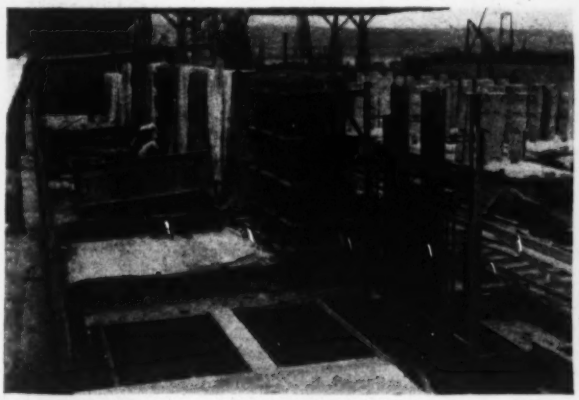
To keep up with the programmed construction schedule, it was necessary to plan a casting yard with a capacity of about six slabs per day. The site for the yard was selected near the west waterway in the south part of Seattle, where there is ample space for materials storage and convenient spur tracks. Foundation for the casting bed consists of a concrete slab 5 in. thick and about 180 ft. long. On this slab was laid a 2-in. plank floor to provide a bed convenient for fastening down metal facing for forms. Over this timber flooring was placed a layer of 18-gage steel, fastened down with countersunk screws.

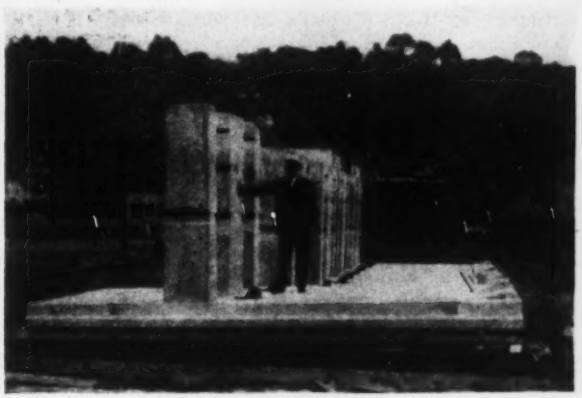
For each slab a box-like frame, rigidly bolted together and faced with metal lining, is placed on the steel bed-sheet. Within this form the steel reinforcing is assembled in place, wired together for support and held in place partly by the timber form for the portion of the slab that is cast upright. Much of the weight of reinforcing in this upright part is carried by hooks slung from the top of the heavy timbers of the form. Steel in the horizontal part of the slab is suspended from short pieces of old rail laid across the form.

The forms are lined up by transit, and the upright leg is supported rigidly by two braces made of 3-in. pipe with the ends flattened to afford convenient means of bolting in place. The forms are of the panel type bolted together and made up with a view to repeated use; some have been used more than 25 times. Panels for the base slab are made up of three 2x6's bolted to transverse members in such a way that shrinkage will not warp the metal facing; all panels are cleaned and oiled before each reassembly.

Ready-mixed concrete, delivered to the job in trucks, contains a finely ground cement and a well-graded gravel-and-sand aggregate with 1.73 bbl. of cement per cu.yd. Water-cement ratio is varied somewhat for different parts of the work, the range being from a 3½- to a 5-in. slump. In the B and C type slabs the large amount of steel calls for the wet mix.

A major feature of the casting operation is the method of compacting the concrete. This is done by using vibrators progressively across the horizontal slabs; that is, concrete is dumped first at one end of the form, and the vibrator is started there. As more concrete is dumped in, the vibrator moves lengthwise across the form, thus tending to keep air bubbles ahead of finished work and to secure a dense placement. With a highly effective vibrating program and the gravity pull, it is found that rich





CASTING YARD (left), showing form set-up for slabs of L-shape type and storage yard in background. Finished slabs (right) are lying on face in storage. Note notches in recesses for timbers.

mortar and the heavier rock move down toward the bottom face, giving a surface which, in the finished slab, has an almost glassy smoothness. Vibrators are used in both the upright and the horizontal forms.

The slabs are poured in forms placed in alternate locations along the casting bed. After the forms have been removed from the first four slabs, the alternate slabs are cast in place between and against those first cast. The surface of the concrete against which fresh concrete is to be placed is thoroughly coated with a film of tallow. This reduces formwork and insures a perfect fit because each slab is numbered and eventually is placed in the seawall in the same relation to other slabs that it occupied on the casting bed.

Slabs are left on the forms until compression cylinders show a strength of 3,000 lb. per sq.in. They are then moved by an A-frame derrick to storage space near by. To date this has required an interval of about seven days. Storage is provided for about twenty slabs. The casting program is governed by estimated progress on the job, which calls for the construction of 32 ft. of seawall per day. Casting beds are provided for 21 slabs.

Specifications required that the concrete show a 3,000-lb. per sq.in. strength after 28 days, and with the care taken to secure effective compacting, this requirement always has been exceeded. In a recent 28-day test of nine samples in compression, the lowest showed 5,3[illegible] lb. and the highest 7,835 lb. per sq.in. The average was 6,600 lb. per sq.in.

Contract for casting the slabs is held by the General Construction Co., of Seattle. Thomas R. Beeman is [illegible] engineer. Clark Eldridge, as bridge engineer, is in charge of the seawall design and construction, and H. F. Faulkner is in charge of tests.

Taxes Paid by Motor Vehicles Exceed a Billion Dollars

Totals from a careful count by the Bureau of Public Roads of all sources of tax income from motor vehicles in 1932 and 1933

THE TAX PENALTY paid by the people of the United States for owning and operating motor vehicles exceeds a billion dollars annually. This figure is from a report by the Bureau of Public Roads, a summary of which is published in its official journal, *Public Roads*, for October, 1934, and is the total of probably the most complete count ever made of the tax income of all kinds from motor-vehicle operation. A group of bureau engineers and statisticians have worked for a year collecting the figures and breaking them down into tables and text occupying in the summary alone 30 pages of the size on which this account is printed.

Only a summary of principal tax income sources is practicable, and this is made in the accompanying table. Comparison is made between the payments by motor vehicles in 1932, as given by the survey (plus certain other items) and the data on state motor-vehicle and gasoline taxes for 1933, given in the annual tables published by the bureau, together with the 1933 payments of federal excise taxes relating to motor vehicles. No data were obtained on payments in 1933 of county and municipal fees and taxes, personal-property taxes or public bridge tolls.

The data for the two years are not comparable in all respects because of differences in the manner of reporting; for example, eight states reported buses with trucks in 1933. In order to make the comparison as close as possible, certain modifications have been made in the manner of presenting the 1932 data. In the 1933 table, special fees paid in lieu of registration fees in California, Maryland and South Carolina were tabulated as registration fees. To conform with this procedure, similar payments in 1932 have been deducted from special fees and added to registration fees, the states concerned being those given above and West Virginia. Certain items have been added that were omitted from the 1932 survey totals because they were not regarded as direct taxes imposed on motor-vehicle owners. These include dealers' licenses, certain miscellaneous receipts of the motor-vehicle departments, including fines and penalties in a number of states, and miscellaneous receipts connected with the administration of the gasoline-tax laws. These additions were made so that the 1932 tabulation would conform with the published data for 1933.

It has been pointed out that the reported figures for county and municipal taxes on motor vehicles in 1932 and for public-bridge tolls are incomplete, while those for personal-property taxes are an approximation believed to be nearly correct. There is no reason to believe that there was a decrease in those items for which no data were obtained in 1933. If we assume for the purpose of comparison that they were the same in both years, we find that the payments of motor-vehicle taxes in 1933 exceeded those of 1932 by more than $135,000,000.

COMPARISON OF MOTOR-VEHICLE TAX PAYMENTS IN 1932 AND 1933 AS REPORTED BY THE U. S. BUREAU OF PUBLIC ROADS

Item	1932	1933	Increase or Decrease in 1933
Vehicles registered:			
Passenger vehicles[1]	20,885,814	20,600,543	— 285,271
Trucks and tractor trucks	3,229,315	[2]3,226,747	— 2,568
Trailers and semi-trailers	415,276	472,789	+ 57,513
Motorcycles	89,197	91,987	+ 2,790
All vehicles	24,619,602	24,392,066	— 227,536
Registration fees[3]:			
Passenger vehicles[4]	$218,907,499	$195,841,695	—$23,065,804
Trucks and tractor trucks	71,444,038	[2]70,298,260	— 1,145,778
Trailers and semitrailers	3,682,872	4,298,007	+ 615,135
Motorcycles	[5]26,889	320,833	— 6,056
All vehicles	294,361,298	270,758,815	— 23,602,483
Special taxes paid by commercial carriers[6]	4,058,671	5,398,154	+ 1,339,483
Operators' and chauffeurs' licenses	18,280,802	18,075,282	— 205,520
Certificates of title	4,340,239	3,507,984	— 832,255
Dealers' licenses and plates[5]	1,913,977	1,596,647	— 317,330
Miscellaneous fees:			
Included in 1932 survey	4,742,729	.....	+ .....
Not included in 1932 survey	3,020,457	8,755,337	+ 992,151
State gasoline taxes[8]	514,138,900	519,403,450	+ 5,264,550
All state fees and taxes	844,857,073	827,495,669	— 17,361,404
County fees and taxes (incomplete)	1,703,455	.....	.....
Municipal fees and taxes (incomplete)	14,157,822	.....	.....
Personal-property taxes (estimated)	35,880,000	.....	.....
Federal excise taxes[7]	92,377,998	244,825,000	+ 152,447,002
Public-bridge and ferry tolls (incomplete)	18,199,424	.....	.....
All fees and taxes	1,007,175,772	.....	+ 135,085,598

[1]Includes private passenger cars, taxicabs and other cars for hire, and buses.
[2]Buses registered with trucks in eight states.
[3]Includes special fees (receipts taxes, ton-mile taxes, and passenger-mile taxes) paid by common-carrier trucks and trailers and public-carrier buses in lieu of registration fees. Amounts: in 1932, $1,172,121 paid in California, Maryland, South Carolina and West Virginia; in 1933, $1,033,931 paid in California, Maryland and South Carolina.
[4]Special taxes paid in lieu of registration fees deducted. The 1933 figures are incomplete, as a number of states imposing special taxes failed to report them.
[5]Not included in 1932 survey total.
[6]Includes item "other receipts under tax law," $1,091,661 in 1932, and $1,207,738 in 1933. This item was not included in the 1932 survey total.
[7]Includes federal excise taxes on gasoline, lubricating oil, tires and inner tubes, automobiles, motorcycles and trucks and parts and accessories. Deductions made to allow for non-motor-vehicle use of gasoline and oil.

New Building Form Introduced by Mercury-Steam Power Plant

Notable all-welded "outdoor" plant at Schenectady consists of equipment units with a one-story enclosure about their bases, the roof being used as an operating deck

By D. A. Allee
Construction Engineering Dept., General Electric Co., Schenectady, N. Y.

AN INDUSTRIAL STRUCTURE of unique form designed completely along functional lines has been built at Schenectady, N. Y., by the General Electric Co. It is a mercury-steam-electric generating plant supplying the General Electric Co. with steam and furnishing a byproduct (electricity) to the New York Power &

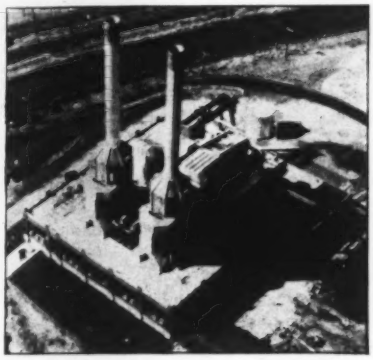


FIG. 1—FUNCTIONALISM in building design attains a high degree of development in this new mercury-steam-electric power station at Schenectady, N. Y.

Light Co. Practically the entire plant—structure and equipment alike—is arc-welded, shop and field, with some of the heaviest details and complicated connections yet attempted with this means of assembly.

The future of any plant is always problematical as regards capacity, size, type of units, etc., and this was outstandingly true in this case. Two fundamental ideas governed the design, and it is believed that future growth will be much simplified thereby. First of these is the elimination of practically all building, substituting, so far as practicable, segregated engineering structures. The second is the use of the "unit system," meaning in this case that a cross-section or "slice" of the station includes (with some unavoidable exceptions) a complete operating unit. If it were possible to include in this slice everything that is necessary for making an addition to the station, the arrangement would be ideal.

From these considerations there evolved a fixed two-story structure where the offices, laboratories and controls are located, and appended to this is a one-story station that may be characterized as of "budding" type. Initially this budding station has two units. A third will soon be added, and more will follow. Each station unit as added will handle its own coal, ashes and smoke and may, therefore, be made strictly modern even to changing the type of equipment.

The groups that are thus gathered together to form an operating unit are in general structurally independent of each other and, so far as this is true, may be independently erected and the equipment of the group may be independently installed. As an example, the steam boiler rose directly on the building mat in advance of any part of the building structure and independently of all other groups.

Equipment and operating cycle

In the Schenectady plant one unit includes a mercury boiler, a mercury condenser and a mercury-vapor turbine capable of producing 20,000 kw. of electricity and 330,000 lb. of steam per hour. The other unit is a conventional steam boiler of 330,000 lb. per hour capacity and a non-condensing turbine generator capable of producing 6,000 kw. Each of the boilers has its own stack, coal bunkers and other equipment. The mercury equipment carries the base steam load, and the steam boiler supplies peak load and stand-by service.

The cross-section through the mercury-vapor unit (Fig. 2) shows the principal items of equipment. The mercury boiler consists of seven drums, installed directly over the furnace. Each drum is equipped with a number of porcupine tubes radiating downward. The upper half of the furnace walls is mercury-cooled by circulating mercury through wall tubes, while the lower half and the slag-top bottom are water cooled, using boiler water. Mercury vapor formed in the boiler tubes and in the mercury wall tubes is collected in the seven boiler drums, and from these it passes through pipes and a control valve into the mercury turbine (located behind the mercury condenser boiler in Fig. 2). The vapor, after performing its function of operating the mercury turbine-generator, is discharged into the mercury condenser boiler under vacuum at a very high temperature (possible because of the unusual properties of mercury) where the heat of condensation

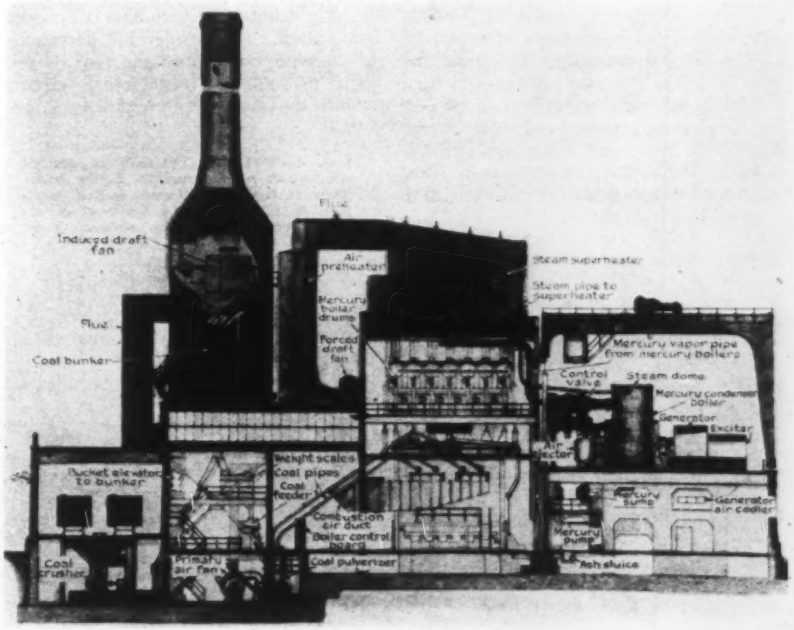


FIG. 2—LONGITUDINAL SECTION through plant showing mercury equipment. Note truss, which carries a load of 1,250,000 lb. from the seven mercury boiler drums.

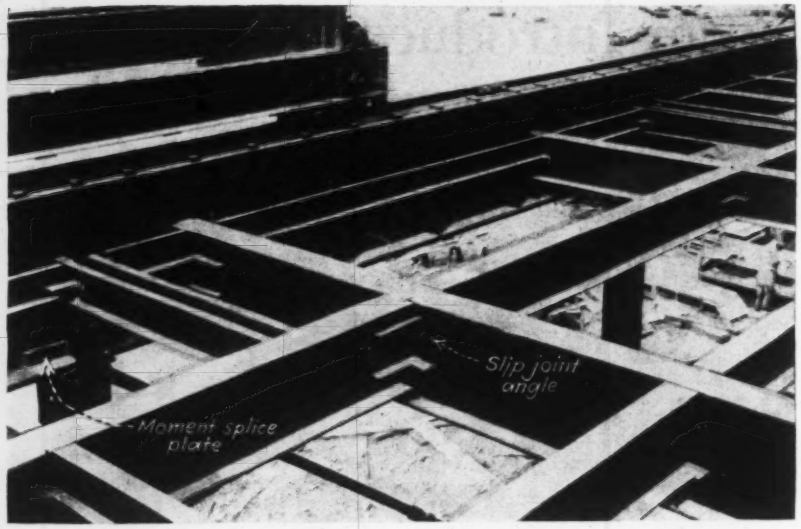


FIG. 3—WELDED CONNECTIONS used for the deck supporting the mercury condenser and turbine and for the crane girder. Note special seat connection, using channels and slip-joint angle, whose outstanding leg is unwelded, permitting beam to deflect but providing it with lateral support. Crane girder is continuous, with top flange butt-welded and the web spliced for moment by a plate passing through slots in the stiffeners.

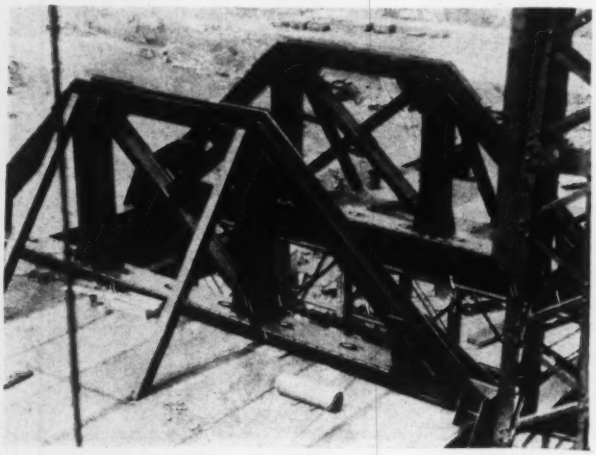
generates steam at about 450 lb. pressure, which is then conveyed to the superheater located in the final pass of the mercury boiler. The liquid mercury is pumped back to the boiler to repeat the cycle.

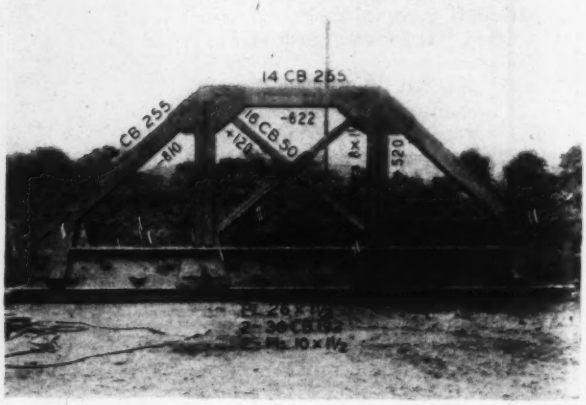
With the two station units that have now been installed, steam at approximately 425 lb. gage and 750 deg. F. total temperature is produced independently, either by the steam boiler or by the mercury condenser boiler. When both operate, they simply turn their steam into a common main. Before turning this steam over to the previously existing system, which operates at approximately 200-lb. pressure, the steam is passed through a non-condensing turbine that produces 6,000 kw. of power and acts as a pressure-reducing valve. A similar non-condensing turbine located in the factory is used in a similar manner for power production and pressure reduction. The 200-lb. steam thus available (desuperheated when necessary) is still of better quality than that made by the old power stations. It is used in the existing factory system for power production, general factory purposes, testing and heating.

An "outdoor" power station

The building at the base of these engineering structures is for the most part one-story high, the equivalent in cubic capacity of the basement of a conventional power house. The roof, more especially around the turbines, is an operating deck. A considerable percentage of the equipment is on the roof or projects through it, from which circumstance the station is commonly known as an "outdoor" station. The purpose behind its design was not to get equipment out of doors, but to get away from the restrictions imposed by a building. The original conception of the station was that the space within the special engineering structures and foundations would provide sufficient space for equipment that needed housing. When the plant is analyzed, it will be found that this is essentially true. The building itself, though small, is loaded very heavily in parts. The same is true of the structures that carry the equipment. The entire layout is electric-arc-welded.

FIG. 4—WELDED TRUSSES of unusual size, which support mercury boiler drums. View at left shows trusses erected, while that at right gives the make-up of the members and their stresses.





Continuous-mat foundation

All of the loads are carried on a continuous reinforced-concrete foundation mat. This mat is supported on concrete piles spaced 4 ft. on centers, minimum, resulting in an estimated average loading of 17.5 tons per pile and an estimated maximum pile load of 28 tons. Very heavy two-way reinforcement is used in the mat, both top and bottom. This reinforcement is arc-welded, making all bars continuous; lap welding was considered safe and satisfactory for the splices, since the reinforcing was two-way and well embedded.

A distinction should be made in structural design between "live" and "dead" loading, though the line of demarcation is not well defined. "Live" machines, especially when large in capacity and of high speed, are preferably made structurally independent of the building and supported on reinforced concrete. Our high-speed steam turbine was thus supported. Our 900-r.p.m. mercury turbine was similarly supported, and the building framing was designed for segregation, but initially the two were rigidly united. This was considered to be a good opportunity for first-hand observation in connection with vibration transmission. Our previous theories and observations in this respect now seem to be corroborated. The foundations are very satisfactory, there is no local evidence of vibration, but there is some vibration at very remote points.

Continuous structures transmit vibration to great distances, the vibration appearing along the line only in objects that resonate naturally to the impressed frequency.

An example of the magnitude of the loads carried is furnished by the group of mercury equipment consisting of the turbine, the generator on the same shaft with the turbine and the pair of condenser boilers. The combined weight of this group is about 1,000,000 lb., while the total weight of all mercury-turbine and condenser equipment, including the foundation and miscellaneous items, is nearly 3,000,000 lb. These figures bring home the point that a low level is advantageous for this equipment both because of the loads involved and because of the relative simplicity of providing a structure satisfactory from an operating point of view. In previous mercury installations other considerations decreed that the units be supported at a considerable elevation on structural steel integral with the building.

Another item of interest in connection with the loadings is that careful consideration had to be given to those involving mercury. The installation uses about 300,000 lb. of this liquid, which, in performing its function, travels about the plant at a considerable velocity.

Heavy welded framing

Some of the heaviest framing in the building is required for the turbine deck and for gantry-crane supports. The beams of the turbine deck are in many instances 30 in. or more deep, with reactions of 60,000 to 80,000 lb. Special seated connections were used, as shown in Fig. 3, consisting of a pair of short channels shop-welded to either side of the web, to transmit the load to the seat, which was welded to the girder. In this same view are shown the clip angles (also welded to the girder), which provide lateral support for the beam. It will be noted that the outstanding legs of these angles are not fastened to the beam, thus leaving it free to move under deflection.

One of the heavier structures is the runway carrying a gantry crane of 50 tons capacity, also shown in Fig. 3. The crane itself is welded, as is the supporting structure. The runway girders are very substantial members. The span is 27 ft., and the girder, 50 in. deep, is fabricated entirely of plate material. The end bearing stiffeners are 7x1½-in. bars, while the intermediate stiffeners are 7x¾-in. bars. Intermittent welding attaches the stiffeners to the webs, and their outstanding edges are welded to the flanges. Such stiffeners saved some metal over the use of angles and, in addition, provided positive support for the girder flanges.

These runway girders were designed for simply supported ends, but since the top flanges had to project through the finished roof it became necessary to seal the gap between the abutting ends. This requirement led to butt-welding of the entire top flange and splicing the web for moment at the supports, considering the girders as continuous over the columns. The ends were finished to length, so that compression in the bottom flanges was carried directly in bearing. It is important to note that it is comparatively easy to provide moment splices on a welded girder simply by slitting the stiffener and running the splicing plate through.

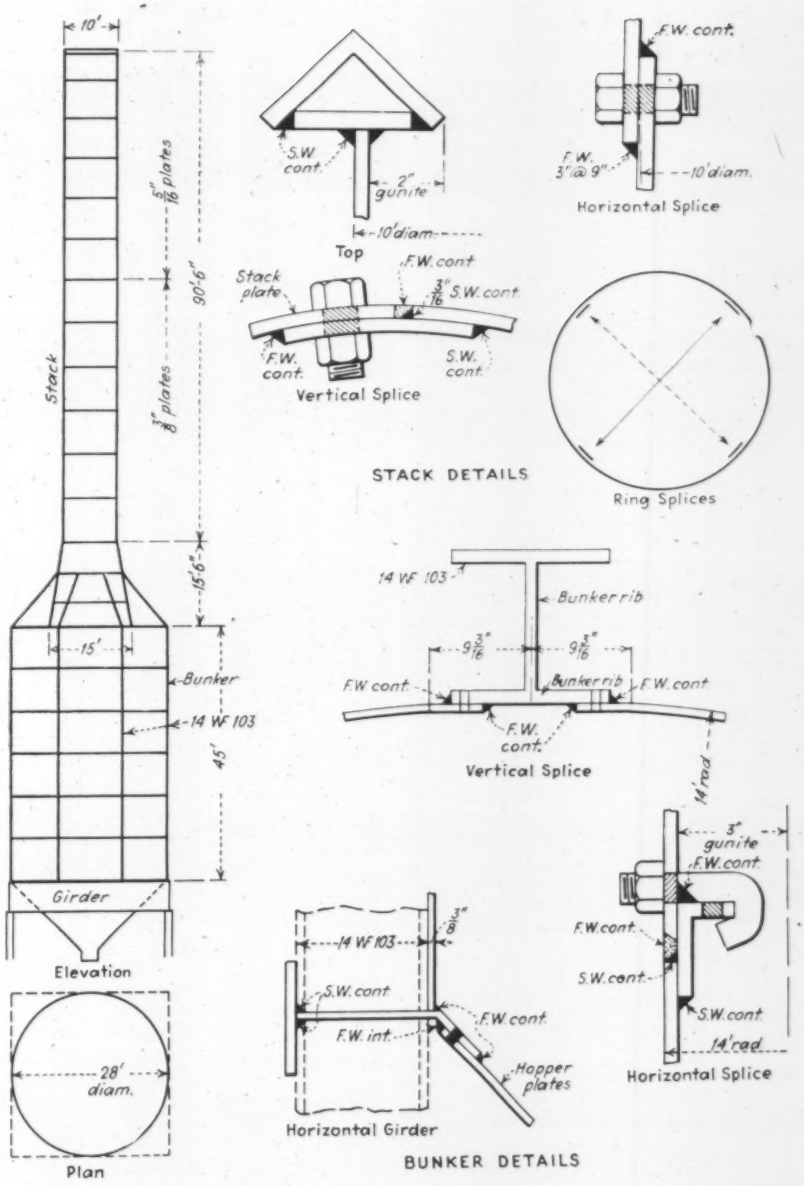


FIG. 5—STACK AND BUNKER DETAILS used in mercury-steam-electric power plant.

Welded trusses carry 600 tons

The mercury-boiler equipment consists structurally of a lower and an upper section. The lower section, made up of the furnace and the steaming water walls, is carried directly to the foundation mat. The upper section, comprising the seven mercury drums and accessory equipment, is suspended by eyebars from the lower chords of a pair of welded steel trusses of unusual size (Figs. 2 and 4). The original design contemplated plate girders, but the necessity for accessibility to the equipment made the trusses preferable. The girders also were very unsightly.

In Fig. 4 are given the stresses in and the sizes of the principal members of one of these trusses, each of which carries a load of 638 tons at a height of about 60 ft. The span is 45 ft. c. to c. of bearings, while the depth of the trusses, c. to c. of chords, is 13 ft. Each truss weighs 30 tons and, owing to the

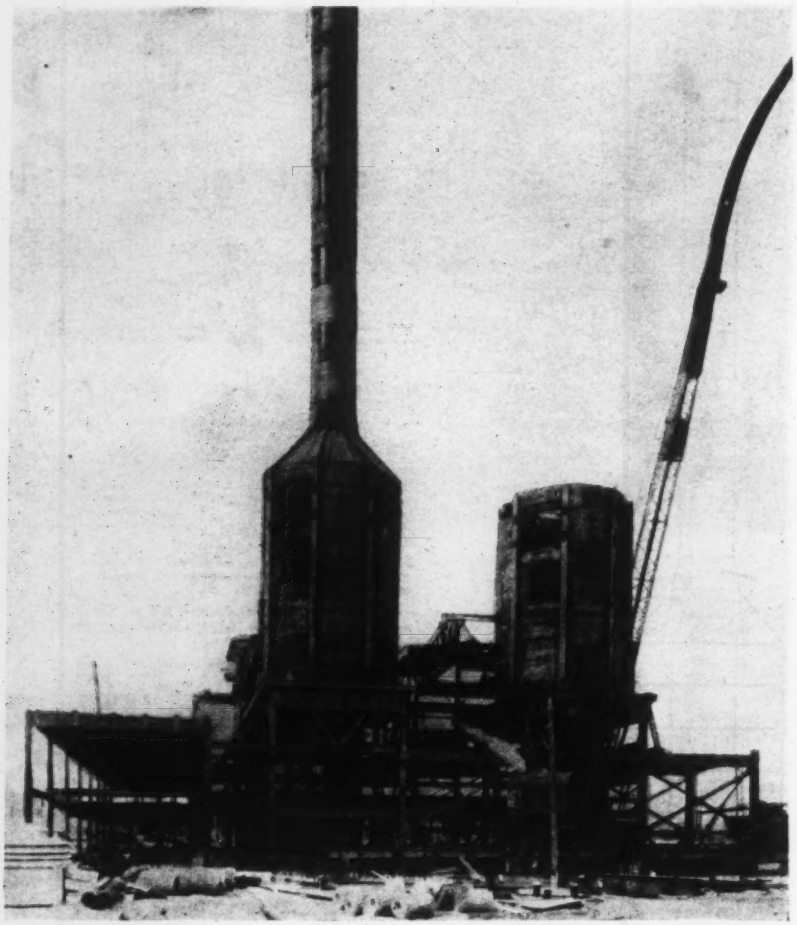


FIG. 6—ERECTING the mercury-steam-electric power station. All field as well as all shop connections were arc-welded.

over-all height of 15½ ft. and the desirability of complete shop fabrication, it was necessary to ship them on two special platform cars.

Most of the load carried by these trusses comes in along the bottom chord. This chord, which is subjected to a large bending moment in addition to the direct stress, is made up of two 36-in., 192-lb. beams, with 1½-in. cover-plates top and bottom. The 7-in. eye-bars that carry the boilers go up between the two beams, and the pins rest in saddles that bear directly on the top flanges of the chord. It will be noted from Fig. 4 that, in order to connect the gusset plates directly to the webs of the beams, it was necessary to block off the outside flanges at the ends and to cut slots at the intermediate panel points.

The end posts and top chords, of heavy H-sections, are milled to bear at the hip joint. All of the main gusset plates in the trusses are 1¼ in. thick, and each truss required about 450 lin.ft. of welding.

The plate girders that support the trusses are somewhat unusual in that they are of box type with the stiffeners on the inside between the double webs, which are 57x1½-in. plates. The span of these girders is 27 ft., and heavy strap plates on all four sides of the columns are used to provide an adequate tie between the girders and the columns.

All-welded stacks

The two stack structures, rising to a height of more than 200 ft. above their foundations, are imposing and pleasing in appearance and are completely arc-welded. At the top is the stack proper. Below this is the fan room, and below it is a 350-ton coal bunker. The support for this unique assembly consists of a four-legged arc-welded structure that has accumulated 1,125 kips per column, the structure straddling certain smoke ducts, coal pulverizers, weigh scales, conveyors and pipes.

The stack comprises about one-half the total height, is 10 ft. in diameter and is lined with 2 in. of gunite. The fan room and bunker cylinder are 28 ft. in diameter, the bunker occupying about 30 ft. of the 45-ft. height, and the fan room the remainder. The coal chamber is lined with 3 in. of gunite.

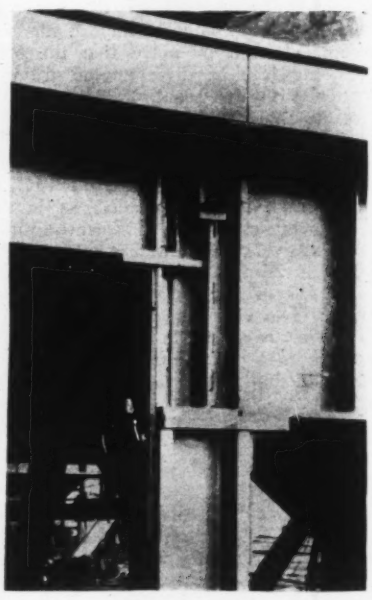
As shown in Fig. 5, the lower portion of the stack is belled out to a 15-ft. diameter. At the top of the 28-ft. cylinder the stack loads are carried to the cylinder walls by heavy framing, the ... down the eight vertical ribs of the cylinder to plate-girder supports (Fig. 5 and 6). These ribs (14-in., 103-lb. H-sections) also carry the fan-room framing and at the base of the bunker are connected to a horizontal ring girder which takes the horizontal loading resulting from the coal hopper and in addition acts as a cross-frame for the rectangular tower structure. The ribs rest on plate girders, in turn supported by the braced column structure.

The stack plates were assembled with bolts, the vertical seams butt-welded with an inside splice, and the horizontal seams lapped to the weather. The horizontal seams were made by continuous field welds on the inside and intermittent (overhead) welds on the outside. There are two vertical splices for each tier of plates, and the splices in adjacent tiers are staggered 90 deg., as shown in Fig. 5.

In the 28-ft. diameter cylinder section, butt welds on the vertical seams were avoided by using the flanges of the ribs as splice plates (Fig. 5), thus giving unlimited tolerance and permitting a lap weld. The horizontal joints that were butt-welded were stiffened (on the inside) with an angle shop-welded to the upper edge of each tier plate. Temporary hook bolts (Fig. 5) were used to bring the upper plate into proper alignment for field welding.

The corner column supporting the ends of two of the plate girders at the bottom of the bunker cylinder provided an interesting welded detail (Fig. 7). Each girder is made up of a 64x½-in. web and 18x½-in. flange plates. The girder, with its web parallel to the column

FIG. 7—TWO GIRDERS framing at right angles under the coal bunkers are supported in bearing on a single column, which carries a load of 1,125 kips.



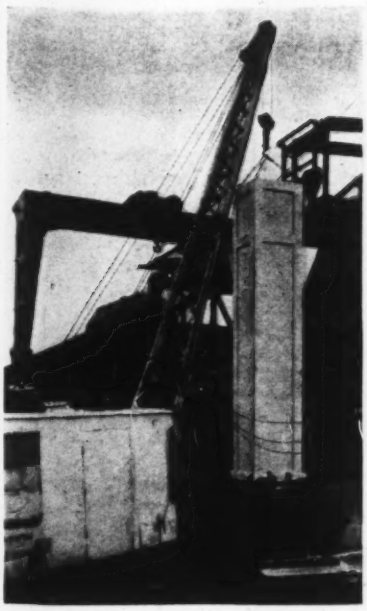
flanges, extends across the cap plate, and its stiffeners are located over the column web. The stiffeners of the girder at right angles are over the column flanges, and the flange plates of this girder are cut back to clear the other girder. The two web plates are tied together by an angle that does not show in the picture.

Building enclosure

The total building exterior except the concrete below the window sills and the glass is of arc-welded steel plate (Fig. 8). The development of this exterior was something of an experiment, but the style seemed to be in keeping with the rest of the assembly. Steel plate ⅛ in. thick was used, resulting in better welding and less distortion than would have been possible with lighter plate. The plates were bent to shape in a "break." It was necessary to butt-weld both the pilasters and the fascias at mid-point of a column or panel length, and it was with some trepidation that we recommended making 50 of these splices that would match so truly as to be presentable in the outdoor light. A sample bay was built and set up in the factory, the execution was good and the work was released. The resulting structure proved to be both economical and attractive in appearance, and it is of heavy enough material to outlast its requirements with little maintenance.

In designing a building exterior of this type there are a few points that stand out as troublemakers. We were very fortunate in having a steel frame that was true to dimension and a concrete-base structure that had been very accurately laid out. Had this not been the case, the assembly of shop-fabricated pilasters and fascias would have resulted in unsightly gaps necessitating field splices, welding and grinding, or similar expensive and undesirable field work. The condensation problem also has to be met and can be taken care of with insulation, if necessary. Finally, specific and careful provision for expansion must be made.

FIG. 8—ARC-WELDED plate steel comprises most of the building exterior not occupied by windows. View shows a pilaster being set in place.



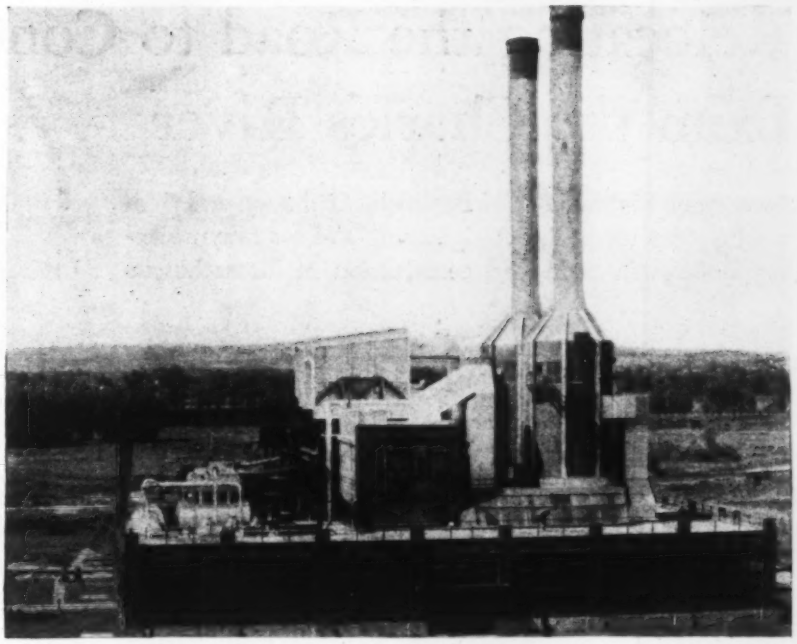


FIG. 9—THE COMPLETED PLANT in which much of the equipment is outdoors, only those units requiring protection being housed.

In addition to its use for pilasters and girder fascias, arc-welding was also used exclusively for boiler housings, penthouses, skylights, secondary roofs that are subject to traffic, for certain walls, copings and parapets and for all stairs and hand-rails. Also it was used for various equipment accessories.

The details of the structural welding as finally made were worked out by the American Bridge Co. The detailing was preceded by a certain amount of preliminary discussion and the preparation of studies covering some of the major details. In general, the details were made so as to avoid the necessity of exact lengths or close tolerances. Also, butt welds of the ordinary type, which must be accurately matched, were avoided by using laps either with or without auxiliary plates.

It may be stated in closing that this job teemed with heavy welded equipment outstandingly more tricky in execution and more highly stressed (requiring not only strength but absolute tightness) than any of the structural work. Viewed purely as a welding problem, the structural work was commonplace compared with the equipment.

The major steel contracts, involving about 1,100 tons of arc-welded structures and 300 tons of arc-welded stack and bunker work, were executed by the American Bridge Co. The building exterior together with other building work, comprising 125 tons of arc-welded steel, was fabricated and erected by the General Electric Co. The engineering of the whole project was under A. R. Smith, engineer of the construction engineering department and managing engineer of the turbine department of the General Electric Co., with the Stone & Webster Engineering Corp. and the New York Power & Light Corp. as consultants.

Rainfall in South Africa Causes Changes in River Courses

Heavy floods and river flow in the normally arid and semi-arid interior sections of Cape Colony and Southwest Africa are reported as causing changes in river courses and are turning attention again to projects for the reclamation of these districts by diverting streams into original but long-abandoned channels and the formation of inland lakes. Traces of old river channels indicate that these arid districts, including the great Kalahari Desert, were originally fertile lands, but that overwhelming floods cut new channels and diverted the rivers to the present courses. These conditions may be repeated, as some old dry river courses have now a heavy flow, and in some cases the present floods are so great as to be cutting new channels and diversions. In fact, it is said after the recent rainy season it may be necessary to remap the rivers and streams in this part of Africa.

Relocating the Road to Concord from the Charles River

New trunk highway out of Boston by Lexington and Concord typifies recent line-straightening and roadway-widening policies in main-road construction in Massachusetts

FIG. 1—WHEELED SCRAPERS holding 12 cu.yd. and operated by 75-hp. tractors are the unusual road-grading equipment working on the new Boston-Concord highway.

RECONSTRUCTION of trunk highways out of Boston includes as this year's main operation a 15.2-mile relocation from Cambridge to a little beyond Concord, Mass. The old road (of rather crooked alignment, as shown by Fig. 2) provided only two traffic lanes having old-type bituminous surfaces, and it suffered also from the local traffic congestion inseparable from a route passing directly through towns and thickly settled land. The new road, with six traffic lanes at its Cambridge end, carries through with four lanes of modern high-type pavement. As in the work of improving the Boston-Worcester Turnpike (*ENR*, Jan. 26, 1933, p. 104), a radical realignment was determined on; this, however, in the case of the Cambridge-Concord road involved a more complete relocation than was adopted on the road to Worcester. Almost all of the 15.2 miles is a new and straighter line.

Over-all characteristics

Primarily the Cambridge-Concord road exemplifies the broad approach of the Massachusetts highway officials to the problems of trunk-line road revision that are confronting them. With these main routes long ago highly improved and continuously well maintained, the old locations are boldly broken away from and new routes adopted that afford liberty in planning the alignment, grades and roadway widths demanded by increasing vehicle frequencies and speeds. Coincidentally, this involves boldness in incurring heavy money expenditures and large construction volumes. These in the Cambridge-Concord road total 1,754,550 cu.yd. of excavation, 79,050 cu.yd. of concrete pavement and an expenditure of $2,466,520, not including land damages.

In the second place, the Cambridge-Concord road is representative of Massachusetts main-road standards. These in this case include a 100-ft. right-of-way with slope easements for cuts or fills that extend beyond the 100-ft. boundaries; multiple-lane bituminous macadam and concrete pavement on rolled gravel base; minimum 1,000-ft.-radius superelevated curves; grade-separations at traffic-control intersections and steel or concrete bridges of 60- to 78½-ft. clear width. In crossing the high ridge 5 miles out of Cambridge, 7 per cent grades were adopted, but in other parts of the route moderate grades prevail.

With rugged country to be traversed by the road, these requirements explain the high totals given of expenditure and work volumes. Broken down into main classes the quantities are:

Classification	Cu.Yd.
Earth excavation	671,000
Ledge excavation	53,200
Ordinary borrow	784,100
Gravel borrow	245,850
Pavement concrete	79,050

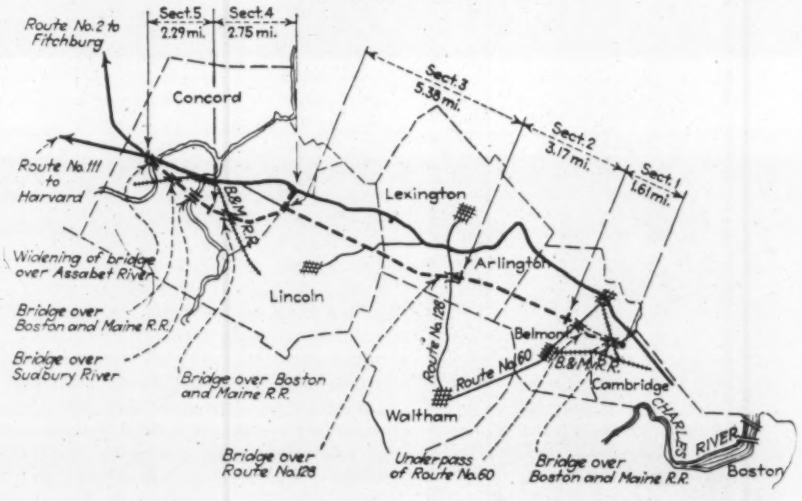
Including the gravel borrow for rolled base, the preparation of emplacement for the pavement required 120,000 cu.yd. per mile of grading.

Three types of paving

The pavement represents practices which set Massachusetts road work apart from general practice. The differences are not in pavement types, which are concrete and bituminous macadam; but two types of concrete construction are employed, and standards are set for bituminous macadam materials and workmanship that are equalled in only a few states. These characteristics, as represented in the Cambridge-Concord road, are important to consider.

Essentially the Cambridge-Concord road is concrete, but bituminous macadam is substituted over fills for about half (0.5 mile) of the Cambridge section (Sect. I, Fig. 2) and for the 3,000-ft. cross-connection at the beginning of Section IV. The concrete paving is of two types, one a two-course construction (sheet concrete) for 8.55 miles of sections II and III, and the other a single-course concrete for all the remaining

FIG. 2—RELOCATED ROUTE and old line of road out of Boston northwest by Lexington and Concord.



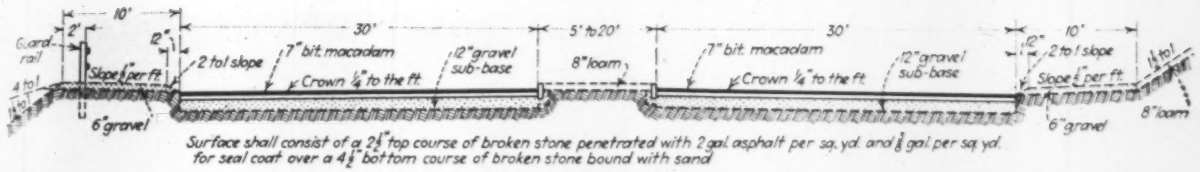

10'
2'
12"
30'
5' to 20'
30'
10'
Guard rail
Slope 1" per ft.
2 to 1 slope
7" bit. macadam
Crown 1/4" to the ft.
12" gravel sub-base
8" loam
4 to 1
1/2 to 1
6" gravel
Surface shall consist of a 2 1/2" top course of broken stone penetrated with 2 gal. asphalt per sq. yd. and 1/8 gal. per sq. yd. for seal coat over a 4 1/2" bottom course of broken stone bound with sand

FIG. 3—BITUMINOUS-MACADAM six-lane pavement at the Cambridge end of new Boston-Concord trunk road.

concrete mileage. The two types of concrete are shown by Fig. 4. Fig. 3 is typical of the bituminous-macadam construction, and particularly of the six-lane pavement, some of it concrete, in the metropolitan section (I) of Cambridge, Arlington and Belmont. Toward the end of Section I the grass center strip narrows to a point and the six-lane width to four-lane width that is standard to the end of the road.

Both the bituminous and the concrete pavement structure are sufficiently explained by the drawings. The two-course concrete is the only considerable novelty. It was adopted on sections of the Boston-Worcester turnpike, and it is again used here as an extensive trial of possible advantages, when resurfacing is necessary, of having a top course that can be scaled off easily because of the weakened bond produced by the burlap diaphragm. Other details are the retention of uniform-depth slabs when practice has turned quite generally to thickened-edge sections and the use of a 12-in. rolled-gravel sub-base under all surfaces, whether bituminous macadam or concrete. In effect, the Massachusetts pavement (for the gravel sub-base is a highway department standard) consists of a superstructure and substructure acting together as a structural unit to carry load. In the sections illustrated the combined parts give a load-distributing structure 19, 20 or 21 in. thick.

Except in the elements indicated, the individuality of both concrete and bituminous macadam paving practice in Massachusetts lies in quality of materials and workmnaship. This is particularly true of bituminous macadam construction. Positive definition of materials is easy, but it is not easy to make clear shades in workmanship; it is in such small differences that the high perfection of the state bituminous macadam construction exists, and to a smaller degree the character of the concrete work.

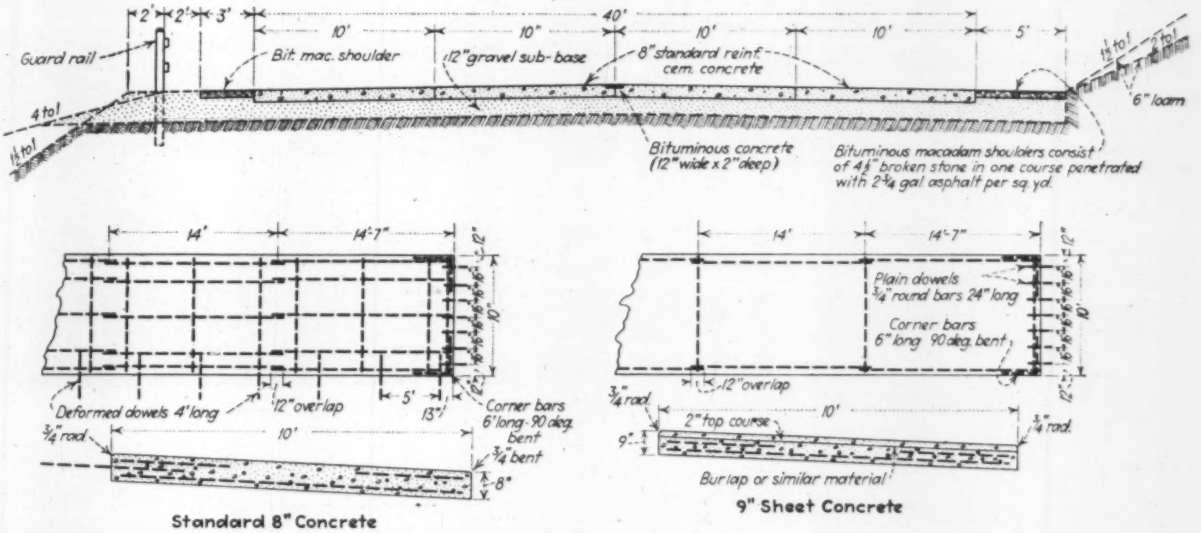


FIG. 4—CONCRETE ROAD SECTIONS, showing two types of slab construction employed on main length of road.

Bituminous Macadam—In constructing the bituminous macadam section, as shown by Fig. 3, the rolled-gravel base is fine-graded to exact profile before the base stone is spread, and at the same time the shoulders are built up to the full height of the surfacing with vertical edges to provide abutments to hold the stone fill. For the base course a mixture of 2¾-in. and of 1¼-in. stone is used, with the smaller stone constituting not more than 40 per cent, rolled to a thickness of 4½ in. The stone is required to have a French coefficient of wear not less than ten and a toughness not less than eight. When rolled to profile, which must be exact, the stone is bound with sand or stone dust and again rolled until the filler sand is settled to just below the surface of the stone with no remnant on top of the stone. Insistence is put on the size of stone, on rolling to true surface, and on complete filling with no surplus of sand or stone dust.

Equal exactness is imposed in constructing the surface course for asphalt penetration. A 2½-in. stone is used in a 2½-in. rolled layer. This stone is required to have a French coefficient of wear of at least 14 and a toughness not less than 12. These specified qualities are those of a high-quality trap, which in fact is the commonly used rock. In surface-course construction insistence on cleanliness and placing to secure uniform bitumen content is strict. Care at edges and joints is stressed to the degree that hand-sorting and placing may be employed. Absolute dryness is required before penetration, and 2 gal. per square yard of 85 to 100 penetration asphalt is used. The bitumen is applied after rolling to true surface, and rolling is repeated after a covering of peastone (¾-in.) is applied. This covering is applied with particular care, just enough at first to prevent pick-up of bitumen by the roller, and then gradually more as the roller works, depending on the surface texture desired. The surface is then swept, and a seal coat (⅜ gal. per sq.yd.) is applied and blotted with peastone. The final surface is required to show no variation greater than ⅜ in. under a 10-ft. straight-edge test.

As described, the details of construction are directed to building up a stone structure with filler and binder serving only to occupy the voids and hold the stone in position. The load-carrying structure is stone, and the traction surface is stone. Trueness of surface is car-

ried up from an exactly true sub-base. Size of stone and selection of stone having a cubical breakage, with cleanliness and careful placing and bonding, insure a homogeneous structure. In their broad requirements these practices are ordinary; the distinctiveness of the Massachusetts work is the meticulous care and skill with which the operations are conducted.

Concrete Pavement—The methods of concrete construction show fewer variations from familiar high standards. Proportioning of the concrete is based on a cement factor of 1.62, with weights of sand and coarse aggregate varying according to specific gravity, and the use of no more than 5½ gal. of water per sack of cement. Aggregate weights for different specific gravities from 2.61 to 3.70 are given in the specifications.

Modern bridge structures

As shown by Fig. 2, all important crossings of railways, streams and trunk roads are bridged. In type of structure there are no variations from common practice; of the six new structures one is a stone-faced concrete arch, one a rigid-frame concrete arch, and four are concrete-deck, steel- or concrete-girder spans on concrete substructures. The seventh is an existing concrete arch widened from 23 ft. to 62 ft. 10 in. Structurally the widths of the bridges, the heavy construction of the girder bridges and the neat architectural design and finish are notable features. The narrowest clear width is 60 ft. The views of Fig. 5 indicate architectural treatment. This is noteworthy for the excellent results being secured with very simple line and ornament.

Grading major problem

The paving of the Cambridge-Concord road, beyond its width, presented no exceptional construction problem. The practice of the Massachusetts highway department is to construct concrete pavement in single lanes with a bitumen-painted doweled joint between. It allows either paving mixers or truck mixers, and both are being used by the contractors. With truck mixers 5-in. mix and mechanical spreaders are required. The remaining processes and equipment are conventional.

Grading is the main construction problem; the volumes are large, the country is rough, and ledge rock and boulders prevail over some miles of the route. To meet these conditions, the contractors have mechanized their work to about the practicable limit (Figs. 1, 6 and 7). In heavy ground the excavation is by power shovels loading to motor trucks, which haul to fills. Where ledge prevails, well drills are used for all large rock movements, and jack-hammer drills for small ledges and boulders. On fills all heavy work is done by bulldozers. The grading presents no novelties in these kinds of equipment or its operation, but the numbers and sizes of units used are exceptionally large.

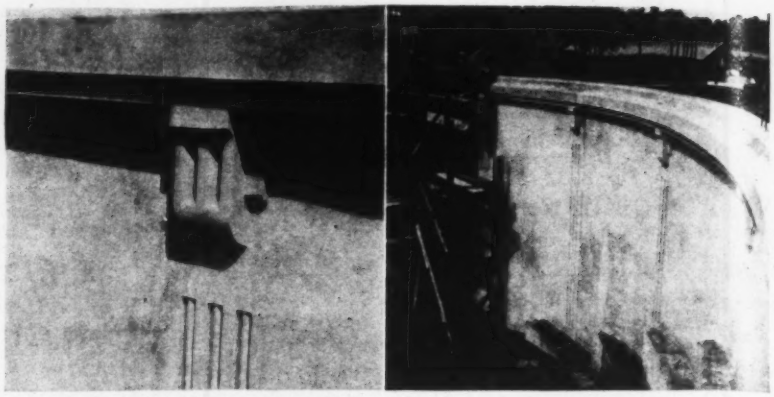


FIG. 5—SIMPLE ORNAMENT AND LINE for concrete masonry of bridges on Boston-Concord road.

FIG. 6—LEDGE DRILLED for blasting by well drills. Tufts of grass and twigs show plugged drill holes.

On the lighter-soil sections, use of carryall scrapers is the unusual feature. These machines, developed in California and most used until quite recently in the far west, call for brief description. As shown by Fig. 1, a carryall scraper and a crawler tractor work in train; the tractor hauls the scraper and is also the power plant for operating the scraper mechanism. The scraper body is mounted on four pneumatic (30-lb.) tire wheels and is a steel box with closed sides and back with the front end open to take on load by scraping action. The rear end of the scraper body is hinged on the rear axle, and the front end is supported by a mast on the front axle so that it can be lowered into scraping position or raised to ride clear of the ground. A

FIG. 7—BULLDOZERS of large size are the major equipment for spreading rock and heavy ground in fills on Boston-Concord road.

gate closes the front end when the scraper is in riding position. When the loaded scraper is to be dumped, the front gate is opened and a tailboard is pulled through the body, scraping the earth out of the front end and spreading it in a layer.

The carryall scrapers on the Cambridge-Concord road have 12-cu.yd. bodies and are pulled by 75-hp. diesel tractors equipped with the mechanism for operating gate and sliding tailboard and for raising and lowering the scraping end. Working in sand and sandy loam, they are handling up to an 800-ft. haul at about 60 cu.yd. an hour.

Section I of the new road is being financed by a 100 per cent NRM grant, and the remainder by a PWA 30-70 per cent grant and loan. It is being constructed for the Massachusetts Department of Public Works (A. W. Dean chief engineer) by B. Perini & Sons, contractors, Framingham, Mass., who are building sections 1, 3, 4 and 5, except the bridge on section III; for this Warren Bros. Co., Cambridge, Mass., have the contract, and Geo. A. Fuller Co., Boston, Mass., holds the contract for section II.

Welded Steel Arch of 166-ft. Span in Czechoslovakia

By Frantisek Faltus

Chief Engineer, Skoda Works, Ltd., Pilsen, Czechoslovakia

ONE of the recent notable examples of arc-welded construction in Europe is a steel-arch bridge of 166-ft. span. It is one of the largest welded bridges yet undertaken and is believed to be the first all-welded arch. Located in the Radbusa Valley near Pilsen, Czechoslovakia, the new bridge consists of two two-hinged arch ribs spaced 20 ft. 8 in. apart having a rise of 35 ft. The bridge was designed and built by the Skoda Works of Pilsen.

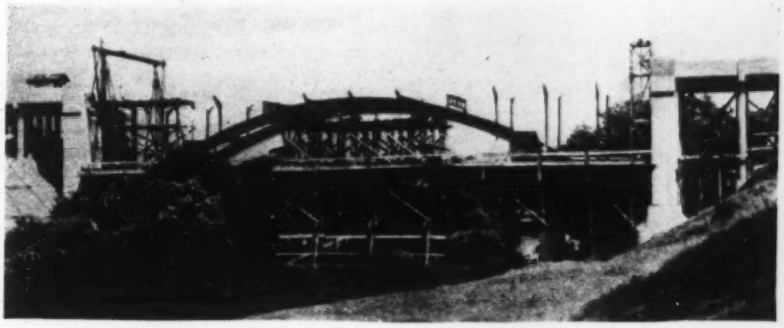
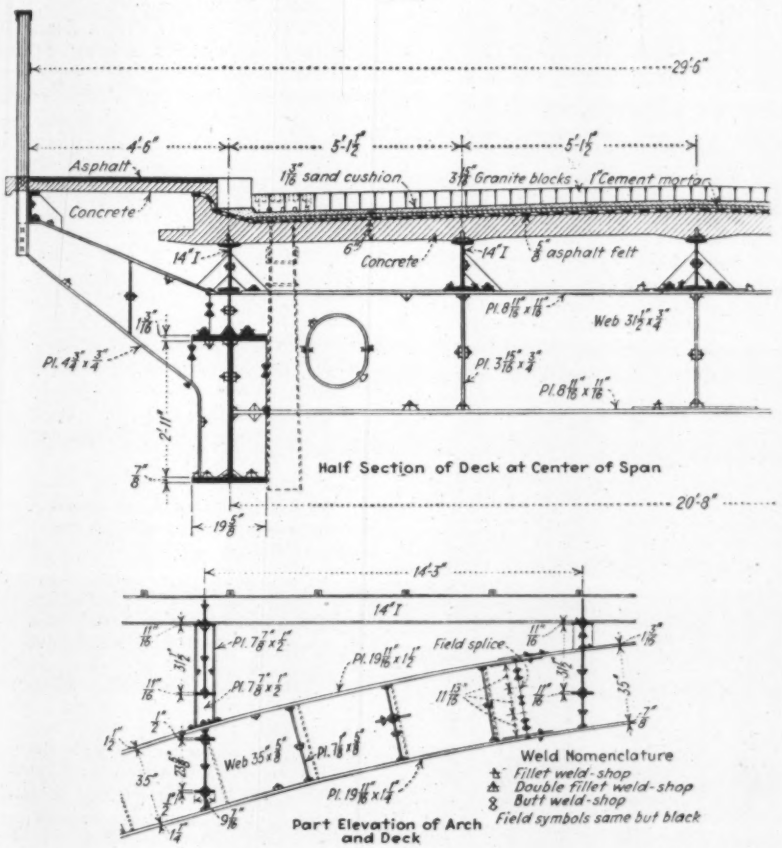


FIG. 2—ERECTING the welded arch ribs of a highway bridge in Czechoslovakia.

FIG. 1—DETAILS of all-welded arch highway bridge, showing a cross-section of the deck and an elevation of the arch rib and the superstructure.



consists of two two-hinged arch ribs spaced 20 ft. 8 in. apart having a rise of 35 ft. The bridge was designed and built by the Skoda Works of Pilsen.

The arch ribs are built up of ⅝-in. webs, 2 ft. 11 in. deep, and two flange plates, 16⅛ in. wide. The thickness of the flange plates is graduated from ⅞ to 1½ in. The arches support the roadway structure consisting of columns, welded columns and cross-girders and rolled longitudinal stringers. The roadway is of reinforced concrete with a granite wearing surface. The total width of the structure is 29½ ft. The structural details are shown in Fig. 1 and the design stresses in the accompanying table.

(Lb. Per Sq. In.)

Part of Bridge	Base Material Tension	Weld Compression	Shear
Floor skeleton	12,100	7,800	11,400	7,100
Arch Ribs	14,500	9,700	13,800	9,000
Incl. wind stresses	19,200	12,800	17,800	11,400

The bridge was erected on a timber scaffolding (Fig. 2). Each of the arch ribs was delivered to the site in five sections and assembled on the scaffolding, bolted together and then welded. After the arches had been welded, the roadway structure was erected and welded. All welds were made continuous. About 6 miles of electrodes were consumed, both bare and covered types being used. The bare electrodes that had a core were used on all fillet welds, and all welds were made in a vertical position. The covered electrodes were used for the butt welds, joining the plates of the main arch ribs, where strength and ductility were necessary.

The weight of the steel structure is 110 tons, of which 47 tons comprise the weight of the arch ribs.

Advances in Soil-Testing Methods

An interview with C. A. Hogentogler and A. M. Wintermyer, of the division of tests, U. S. Bureau of Public Roads

PRACTICAL application in engineering of the knowledge of soil physics given by recent research postulates a development of testing technique and testing instruments available for the engineer's use. In general, the voluminous current literature on stabilizing soils, controlling permeability, action of moisture, settlement and heaving has considered only incidentally the tools for determination. To satisfy this deficiency in some measure, inquiry was made at the laboratories of the Bureau of Public Roads, and C. A. Hogentogler, senior highway engineer, and A. M. Wintermyer, assistant highway engineer of the division of tests, were found to have some important things to say about soil-testing methods and instruments. These comments have been set down here as they developed, with no thought of being inclusive or of presenting a continuous narrative, but to give engineers some of the information on soil testing that seems new and important at the present time.

What is the nature of recent progress in soil testing?

► Recent progress in soil testing has, in general, concerned development of methods and improvement of apparatus more than change in fundamental conceptions. Specifically, noteworthy advances have been made in (1) testing technique required for particular purposes; (2) accuracy of the hydrometer method of analysis; (3) practicability of the liquid-limit device; (4) knowledge of the effect of moisture content upon permeability; (5) the stabilization of soils by grading, manipulation and admixtures; (6) soil-sampling apparatus; (7) improvement in the compression-test apparatus; (8) apparatus for preparing undisturbed samples for test; (9) interpretation of compression-test data; and (10) knowledge of the effect of size of the loaded area.

You say that the type of test varies: What are these classes or types?

► Tests to disclose the basic properties productive of heave or settlement of soil, regardless of cause, may be arranged in four groups with respect to testing technique and application of results. These groups are:

1. Disturbed soils and those close enough to the surface of the ground to be influenced by change of moisture, temperature, frost, etc., are tested in a dried and powdered state for shrinkage, plastic and similar properties, which disclose the characteristics of the soil constituents exclusive of soil structure.

2. Soils to be stabilized with admixtures or by manipulation are tested in samples prepared according to the construction procedure, intended for properties required in stable fills, subgrades and road surfaces.

3. Soils located below the line of seasonal change are tested by means of undisturbed samples in the laboratory or by loading the soil in place in the profile for such enginering properties as compressibility, elasticity and stability, which are furnished by both soil structure and soil materials (Fig. 1).

4. Soils located below the line of seasonal change, whose structure is disturbed by the penetration of piles or other construction methods, are investigated by loading test piles in place or by testing in the laboratory samples remolded from natural structure and at natural moisture content.

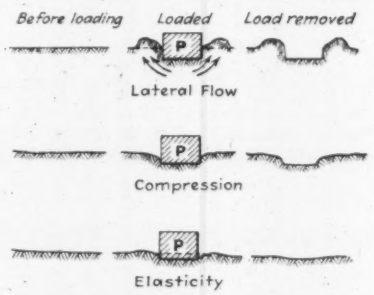


FIG. 1—PHYSICAL PROPERTIES that control the deflections of soil due to load.

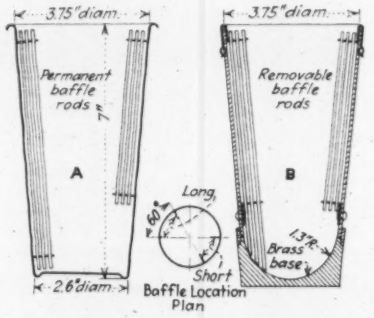


FIG. 2—DISPERSING CUPS (new design on right) used in determining grain-size distribution in subsoils.

TABLE I—PERCENTAGES OF THE FINER SOIL PARTICLES AS DETERMINED BY (1) THE BOUYOUCOS HYDROMETER AND (2) THE PIPETTE METHODS

Sample Number	Percentage of Particles Finer Than — 0.05 mm. (1)	(2)	0.005 mm. (1)	(2)	0.002 mm. (1)	(2)
802	99	100	78	78	54	57
4295	95	97	38	32	29	28
837	94	95	75	72	64	62
872	88	89	45	41	26	29
695	83	85	47	48	36	38
630	81	83	40	41	27	26
4258	81	85	21	22	14	11
659	77	79	22	21	15	15
763	59	67	36	38	26	30
4913	59	56	24	27	14	19
487	58	57	18	16	14	11
4907	12	13	8	9	7	4

Has hydrometer analysis proved to be a practicable and accurate means of determining grain sizes?

► Comprehensive investigations (*Public Roads*, August, 1933) disclose that readings of a sensitive hydrometer in soil suspensions, as proposed by Dr. Bouyoucos (*Soil Science*, April, 1927), serve adequately to produce the data required for the determination of the grain-size distribution in subgrade soils.

With the apparatus (Figs. 2 and 3) and new devices for solving Stokes' formula graphically, the hydrometer test yields, with minimum effort, results agreeing substantially with those furnished by the more elaborate and tedious pipette method (Table I). Harry Hatch (*Proc.*, A.S.C.E., October, 1932) reports that results furnished by elutriation agree substantially with those furnished by the hydrometer.

The errors of the hydrometer method are due either to partial deflocculation (Table II) or to the assumption involved in the use of Stokes' law, and hence are common to all methods utilizing sedimentation. The hydrometer method has now been suggested also for analyzing portland cement (*Public Roads*, May, 1934).

What progress has been made in methods of determining the liquid limit of soils?

► In the older laboratory practice, Atterberg performed the liquid-limit test by adding water or soil powder, as determined by trial, until the desired consistency was obtained. However, with the present mechanical device (Fig. 4) the number of shocks required to close the molded cleft with the soil at different trial consistencies is plotted against the corresponding moisture content to form what are termed flow curves. They have the form:

TABLE II—PERCENTAGES OF THE FINER SOIL PARTICLES OBTAINED BY TREATMENT WITH DIFFERENT DISPERSING AGENTS

(1) No reagent; (2) potassium hydroxide 5 cc. N/1 solution; (3) sodium carbonate 5 cc. N/1 solution; (4) sodium oxalate 10 cc. N/2 solution; and (5) sodium silicate 5 cc. N/1 solution

State	Percentage of Particles Finer Than—0.005 mm. (1)	(2)	(3)	(4)	(5)	0.002 mm. (1)	(2)	(3)	(4)	(5)	0.001 mm. (1)	(2)	(3)	(4)	(5)
Iowa	1.5	18.5	20.0	22.0	22.0	[1]	5.0[2]	12.0	17.0	17.5	[1]	2.0[2]	7.0[2]	15.0	15.5
Miss.	50.0	66.5	82.0	78.0	87.0	[1]	22.5	43.0	59.5	67.0	[1]	14.0	28.0	50.0	56.5
N.C.	[1]	23.0	37.0	29.0	38.0	[1]	6.0[2]	8.0[2]	7.6[2]	27.0	[1]	3.0[2]	[1]	3.0[2]	22.5
Texas	9.0[2]	19.0	40.0[2]	64.0	62.0	6.0[2]	1.0[2]	4.0[1]	34.0	45.0	[1]	[1]	1.0[1]	[1]	29.0

[1] Completely flocculated.
[2] Partially flocculated.

$F = \frac{H - w}{\log N}$ in which F = flow index = change in moisture content for one logarithmic cycle on the flow curve; H = moisture content at one shock on the flow curve; w = moisture content (percentage of weight of dry soil); N = number of shocks; and w corresponding to 25 shocks, is the liquid limit.

On the basis that the shear resistance above the plastic limit is proportional to N, flow curves express the relation between moisture content and shear resistance.

The mechanical method devised by Arthur Casagrande (*Public Roads*, October, 1932) was suggested originally as being especially suitable for plastic soils. Additional investigation has shown it equally suitable for all soils (Table III). Zinc oxide is the only material whose results by the machine method with the brass dish failed to duplicate those furnished by the hand method. However, use of the porcelain dish in the apparatus designed by R. C. Thoreen (Fig. 4) produced the desired agreement even in this case. (See also design by Collings and Stewart *ENR*, May 24, 1934, p. 660).

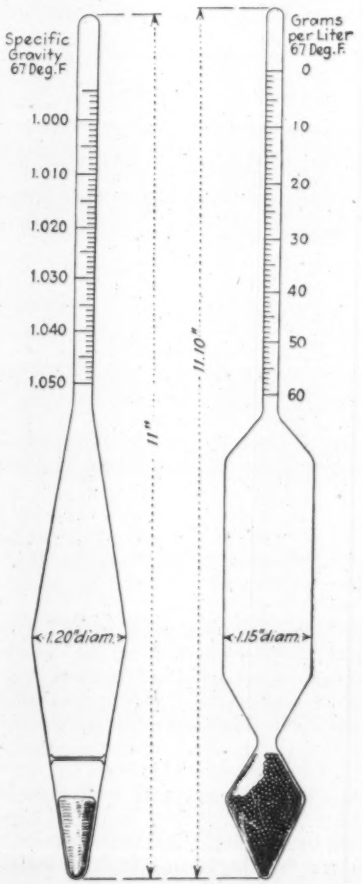


FIG. 3—SENSITIVE hydrometers used to determine grain-size distribution in soil tests.

What advances have been made in the determination of the effects of permeability?

As far back as 1892, Whitney (U. S. Department of Agriculture *Weather Bulletin* No. 4) published formulas for relative flow based on grain size, and also a method for determining the flow through undisturbed samples of soil. The more recent developments have been reported by Terzaghi (*Journal New England Water Works Association*, June, 1929, p. 210), Cox (*Proc.*, A.S.C.E. May, 1933, p. 845) and Hatch (*Proc.*, A.S.C.E., October, 1932). A typical equation suggested by Hatch is:

$$k = 150\, d^2 \left(\frac{V}{45}\right)^6 \left(\frac{t + 10}{60}\right)$$

in which k is the coefficient of permeability in meters per day; d is the effective size in millimeters; V is the percentage of voids; and t is the temperature in degrees F.

In dams, subgrades, soil road surfaces and the like, with the pores containing air, the permeability that controls the rate at which soils soften depends upon the moisture content as well as the porosity. This can be demonstrated by use of the simple device shown in Fig. 5. Soil of known weight and moisture con-

TABLE III—LIQUID LIMITS OBTAINED BY HAND METHOD AND MECHANICAL DEVICE

Sample Number	Material	Liquid Limit—Hand Method Per Cent	Mechanical Method Per Cent
7588	Louisiana clay	80	79
8170	Muck	112	112
8171	Mica	116	114
8172	Kaolin	43	43
8173	Diatoms	136	137
8174	Pumice	52	52
8175	Talc	36	35
8176	Quartz flour	18	19
8177	Zinc oxide	89	92
8224	Reground sand	24	23

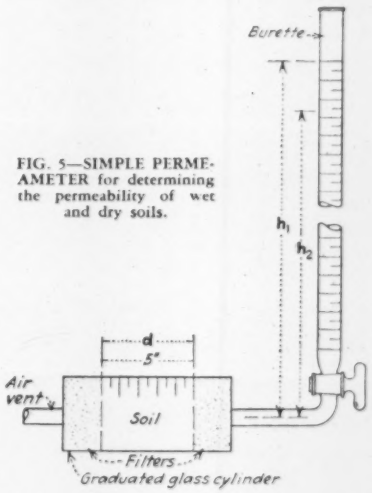
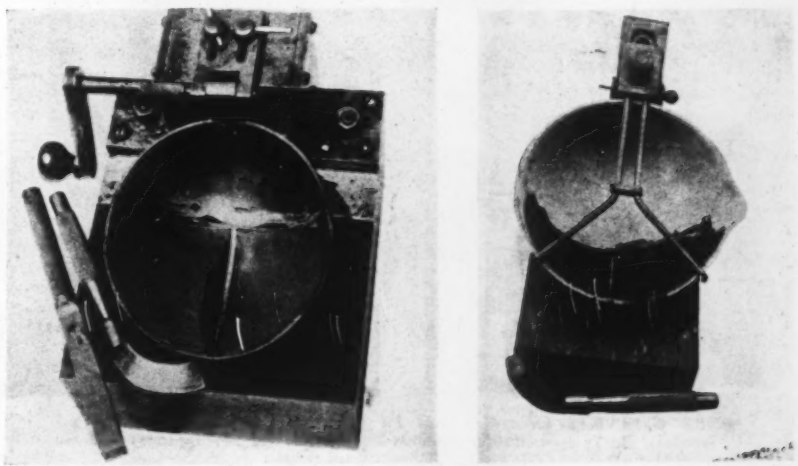


FIG. 5—SIMPLE PERMEAMETER for determining the permeability of wet and dry soils.

FIG. 4—LIQUID-LIMIT testing devices: (left), standard brass-dish device, and (right) simplified device using porcelain dish.



tent is tamped into a glass container of known volume. The coefficient of permeability is determined at both the initial moisture content and that of the saturated sample. The velocity in the first instance is due to both head and capillary attraction; in the second, only to head. The difference is the velocity due to capillarity. (See *Proceedings*, Twelfth Annual Meeting, Highway Research Board, p. 161).

The coefficient of permeability is determined by the common formula based on Darcy's law (*Trans.*, A.S.C.E., 1933, p. 223). It is

$$k = \frac{2\,3\,a\,d}{A\,t} \times \log \frac{h_1}{h_2} \times \frac{100}{P}$$

where k = velocity in centimeters per second at a hydraulic gradient of 1; a = area of burette in square centimeters; A = area of soil sample in square centimeters; t = time in seconds required for the water in the burette to drop from h_1 to h_2; P = per cent of pores carrying moisture; and d = length of wetted soil column, in centimeters.

Results of such tests, Table IV, show how moisture content and character of material exercise the dominating influence on permeability.

TABLE IV—PERMEABILITY OF SAME SOIL AT DIFFERENT MOISTURE CONTENTS AND OF WIDELY DIFFERENT MATERIALS

Sample No.	Solids	Pores: Water: Start of Test, Per Cent by Volume	Pores: Water: End of Test, Per Cent by Volume	Pores: Air: End of Test, Per Cent by Volume	Permeability, k x 10: Total	Permeability, k x 10: Gravity, Cm. per Second	Permeability, k x 10: Capillary
1	54	0	36	10	672	94	578
2	57	13	42	1	656	175	481
3	53	22	40	7	436	200	236
4	56	36	43	1	194	81	113
5	60	0	29	11	4,880	672	4,208
6	40	0	49	11	3,000	289	2,711
7	39	0	51	10	1,400	103	1,297

Notes: Nos. 1, 2, 3 and 4: silt loam sample no. 8316.
No. 5: ground quartz.
No. 6: ground quartz, 80 per cent; diatoms, 20 per cent.
No. 7: ground quartz, 76 per cent; diatoms, 19 per cent; bentonite, 5 per cent.

Is soil-stabilization knowledge making progress toward effective practical application?

► Three effective methods for stabilizing soil have been developed: (1) grading of selected soil materials with or without supplementary treatment with deliquescent chemicals such as calcium chloride, to stabilize the moisture content; (2) compacting soil without change in grading by special means and moisture content to produce maximum density with practical exclusion of air; and (3) special manipulation with admixtures such as portland cement, bituminous materials, chemicals, etc. to produce optimum consolidation with the exclusion of both air and water from the pores. Also, in the broadest sense, surface treatment of soil roads with bituminous materials is a method of stabilization.

Stabilization of the first type applied to the construction of road surfaces has developed rapidly and is utilized quite extensively in practice. (See reports by Dr. Strahan in *Public Roads*, September, 1929; Collings and Stewart, *ENR*, May 24, June 7 and June 14, 1934; also by Traverse and Hicks, *Proceedings*, Thirteenth Annual Meeting Highway Research Board.)

R. R. Proctor's theory and practical application of stabilization of the second type have been reported in detail in *ENR*, Aug. 31, Sept. 7, Sept. 21 and Sept. 28, 1933. The essential features of this system are:

1. All soils whose permeability can be lowered enough to prevent internal erosion are suitable for use in dam construction. Graded materials with 8 per cent of clay on one hand to adobes with 60 per cent or more of clay on the other have been used successfully.

2. The moisture content and the compaction required to produce desired density are determined with simple testing apparatus consisting of a compacting cylinder, a permeameter and a plasticity needle.

3. The compaction produced by a sheepsfoot roller during construction and also the moisture content are controlled by means of the same simple field-testing equipment.

In random trials the density obtained in the compaction cylinder equalled that produced by a load of 3 tons per square foot in the compression test in one instance, and exceeded that produced by drying the soil to constant weight in another.

The general scheme in the third method of stabilization is to penetrate the soil pores with the physical or chemical admixture in suspension, solution or emulsion of the amount required to satisfy the water capacity of the untreated soil and effect optimum compaction by degrees as the mixture dries out.

The purpose of the new tests developed by the Bureau of Public Roads (Annual Report, U. S. Bureau of Public Roads, 1933) for use in the investigation of methods of soil stabilization may be described briefly as follows:

In the current laboratory procedure the binder fraction, or that fraction passing the No. 40 sieve, is tested for several physical characteristics, such as permeability, shrinkage and water absorption. The mechanical analysis of the soil mortar, that fraction passing the No. 10 sieve, is determined. The coarse fraction, that retained on the No. 10 sieve, is tested for grading, hardness, etc.

These tests are satisfactory for fine-grained subgrade soil, but they are limited for disclosing the properties of soils containing only a small percentage of fine particles. They are also inadequate in showing the effect of admixtures that may be incorporated in soils for stabilizing purposes and that may materially alter their properties. In tests (Fig. 6) the entire sample, including coarse fractions, is brought to a state of optimum consolidation and then tested for permeability, capillarity, stability and shrinkage.

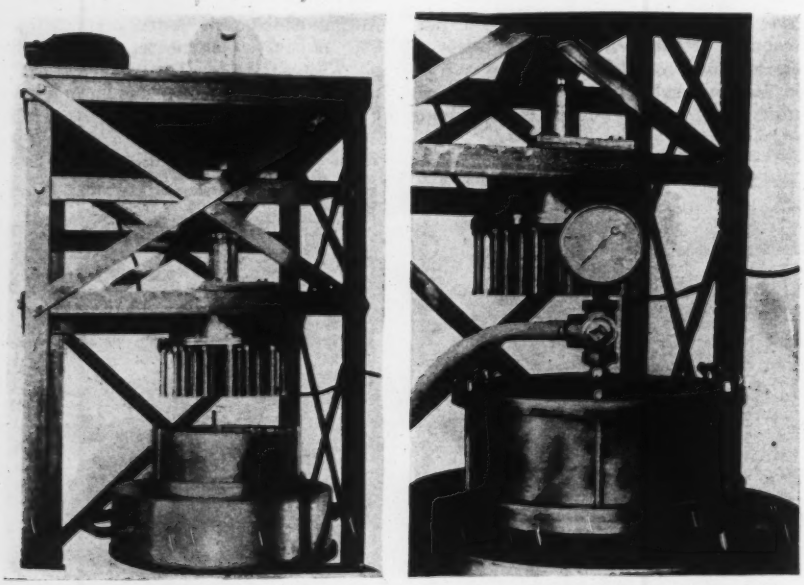


FIG. 6—DEVICES for testing soils for permeability, capillarity, stability and shrinkage (left); apparatus for optimum consolidation (right); apparatus arranged for test of consolidated sample.

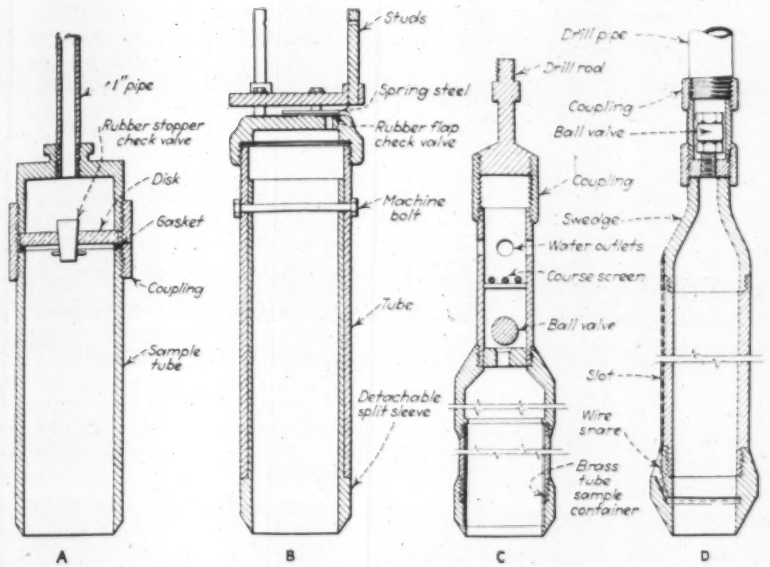


FIG. 7—SAMPLING DEVICES devised by various authorities for obtaining undisturbed soil cores.

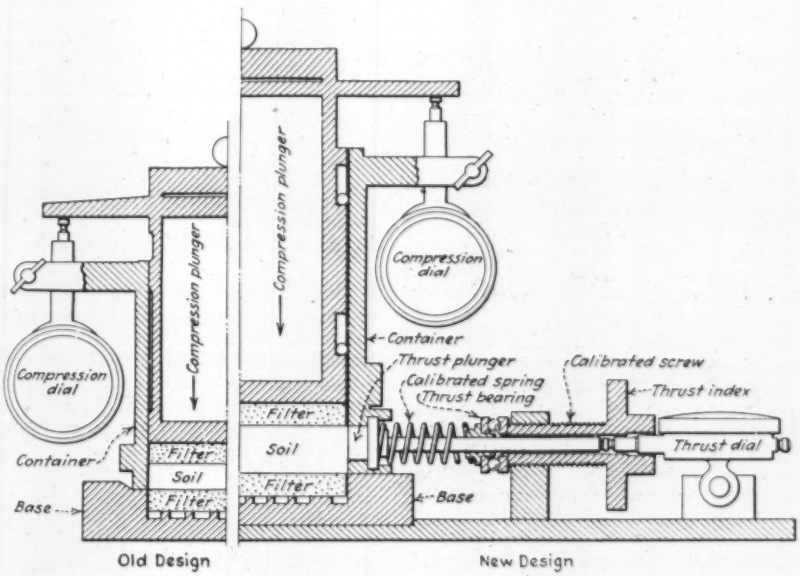
Compressed air and vacuum are utilized to simulate positive and negative head. The capillary rise is indicated by the air pressure required to break the capillary water films in the saturated sample. The principle of the method was proposed by J. H. Englehardt (*Soil Research*, 1929, No. 4, pp. 239-249; see also report by J. S. Joffe and H. C. McLean, *Soil Science*, Vol. 20, 1925, pp. 169-174).

Have satisfactory devices been developed for taking undisturbed or deep-soil samples?

► A number of satisfactory sampling devices have been developed. Four of these for obtaining cores in undisturbed state are shown in Fig. 7. That marked A was used to obtain samples from soft undersoil at Four-Mile Run; B was developed by Glennon Gilboy and used by the committee on foundations of the American Society of Civil Engineers in their work at the Massachusetts Institute of Technology; Moran and Proctor used C for sampling the foundation soil at the site of the Bay Bridge across San Francisco Bay; and D, with the unique feature of a piano-wire snare for cutting the sample at the bottom, was designed by Arthur Casagrande.

In A and C, part of the apparatus is used as the container for sending the undisturbed soil to the laboratory. In samplers A and D, vacuum may be applied to the sample from the surface of the ground. A limited number of tests on cores obtained in these two samplers indicates that the snare is advantageous in sampling highly compacted deposits. For sampling soft materials in disturbed state the projectile sampler designed by Murray and Flood (*Proc.*, A.S.C.E., October, 1932, p. 1302) embodies advantageous features.

FIG. 8—COMPRESSION-TEST apparatus developed by the Bureau of Public Roads enables tests of larger soil samples and the determination of lateral thrust.



What are the improvements in compression-test apparatus to which you have referred?

► Improvements in compression-test apparatus concern the elimination of friction, increasing the size of the sample, use of a compressed spring for maintaining load, and, in one case, the introduction of a device for measuring lateral thrust.

In the new apparatus described by Daniel E. Moran (*ENR*, Oct. 5, 1933) the pistons consist of porous stones mounted in metallic rings. Pressure applied to the water that surrounds the sample during test produces the effect of deep submergence. Samples 2½ in. and 4.87 in. in diameter can be tested. A heavy coil spring and side rods added to the apparatus in the laboratory of the University of California permit of the use of a regular testing machine for applying the required load and the removal of the consolidation cylinder temporarily from the testing machine without affecting the applied load. Spring and rods are utilized also by R. R. Proctor in a similar manner for applying load on this consolidation-percolation cylinder (*ENR*, Sept. 21, 1933, p. 348).

The improved apparatus of the U. S. Bureau of Public Roads, shown in Fig. 8, utilizes ball bearings to minimize the effects of friction between the plunger and the container wall and provides space for a sample about twice as large as the one utilized in the original tests.

Reducing the compression on the calibrated spring, which holds the plunger against the side of the soil cake by means of the slow-motion screw until the spring force just balances the first tendency of the plunger to move, discloses the lateral thrust with a minimum bulging of the soil cake.

The theory for determining the angle of internal friction suggested by Terzaghi (*Erdbaumechanik*, p. 188) is found to be correct by Cox (*Proc.*, A.S.C.E., May, 1933, p. 850). Terzaghi's formula from Mohr's circle of stress is

$$\frac{L}{P} = \tan^2\left(45^\circ - \frac{\phi}{2}\right)$$

in which L = lateral pressure; P = applied vertical pressure; and ϕ = angle of internal friction.

Another formula from Mohr's circle is suggested by H. E. Gruner (*Trans.*, A.S.C.E., 1933, p. 297). It is

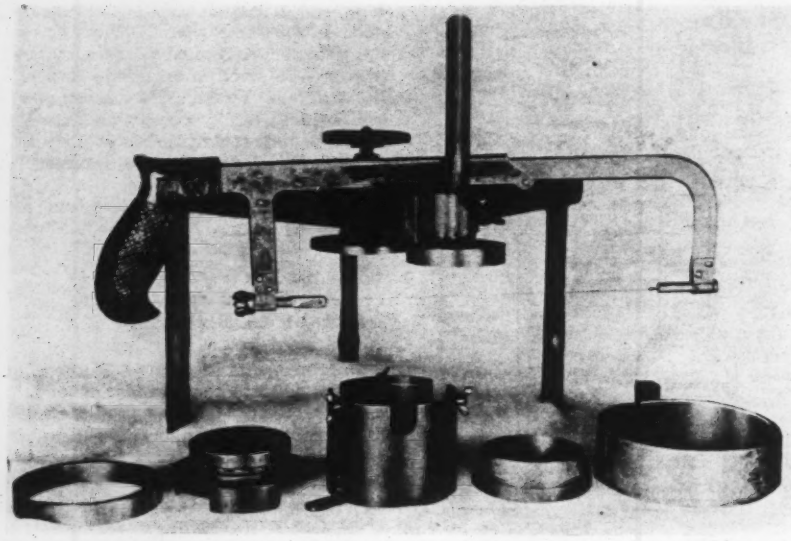


FIG. 9—DEVICE FOR CUTTING to shape undisturbed-soil samples with least disturbance of soil at cut face.

$$\tan \phi = \frac{1 - \frac{L}{P}}{2\sqrt{\frac{L}{P}}}$$

During tests on a sand sample at the laboratory of the Bureau of Public Roads a horizontal pressure of 0.115 tons per square foot was produced by a vertical pressure of 0.33 tons per square foot. By either formula $\phi = 28$ deg. 54 min.

To those interested in the measurement of shear or lateral thrust, attention is also directed to the apparatus developed at the Massachusetts Institute of Technology; by John Griffith, at the Iowa State College; D. P. Krynine (*Trans.*, A.S.C.E., 1929) at Yale University; H. E. Gruner, and Harry Hatch (*Proc.*, A.S.C.E., October, 1932, p 1323).

In shaping undisturbed soil samples for testing, how is disturbance avoided?

► The sample must be cut to the exact diameter of the container, with special precaution taken to keep the depth of disturbance at each face as small as possible. Furthermore, the transfer must be made in a damp closet, to prevent the sample from changing moisture content prior to test.

The cutting apparatus devised by the U. S. Bureau of Public Roads is shown in Fig. 9. It consists of a steel stand with a slow-motion screw (rear), piano-wire saw (above) and, as shown from left to right below, a guide ring, thrust bearing, cutter support, special cutter, and thin metal container. The test sample is cut and placed in the testing device by six different operations (*Proc.*, Twelfth Annual Meeting, Highway Research Board, p. 156).

With possibility of disturbance or change in natural soil samples, how can you interpret test results?

► Undisturbed samples tend to expand when removal from the soil profile releases them from the load of the overburden. To determine how the compression-test data are influenced by this phenomenon, tests of two undisturbed samples cut from the same core are required. One is loaded and unloaded in its natural state without access to water, and the other is tested according to the regular procedure, using water. Results of such tests are shown by the curves in Fig. 10.

The full-line curves show that the voids ratio of the sample at the beginning of the test, free from the influence of water, was 0.482, of which 0.020 represents the air content. The air could hardly have been present in the sample in place because the soil is a very old deposit, laid down in water and compressed by overburden of as much as several thousand feet (note high density) before being moved closer to the surface of the ground by geological disturbances. Consequently, the air must have entered during the transfer of the sample to the testing device. This is further indicated by the fact that at a voids ratio of 0.462 (the pores occupied with water) the sample tested under water is capable of supporting 1¼ tons, just the weight of the overburden at the time the sample was taken on. Tests on a completely disturbed sample indicate that as much as 13 tons per square foot is required to compress the sample to the moisture content of the natural soil.

Extensive original research of this character having to do with the separation of test data due to experimental error from that reflecting the physical characteristics of the samples has gone much to establish the validity of current theories controlling the consolidation of loaded soils.

A study of observed and computed settlements of a hydraulic fill on a rock deposit on the Mount Vernon Memorial Highway (*Public Roads*, March, 1934) shows conclusively that the Terzaghi compression-test data on undisturbed cores furnish an excellent means for estimating the amount and speed of consolidation of loaded soil layers.

In disturbed samples fully saturated and above the plastic limit the volume change, the flow curves and the compression curves are mathematically related as follows:

$$w = \frac{C_o}{SR} + SL = H - F \log N = B - S \log P$$

in which w = moisture content per cent of weight of solids; C_o = volume change upon drying to constant weight in percentage of volume of dried soil; SR = shrinkage ratio; SL = shrinkage limit; H = moisture content at one shock on the flow curve; F = change in moisture content for 1 logarithmic cycle on the flow curve; N = shocks required to close the soil groove; B = moisture content at 1 ton per square foot on the load-compression curve; S = change in moisture content through 1 logarithmic cycle on the compression curve; and P = compression in tons per square foot.

These relationships for quartz, diatoms and bentonite are as follows:

$$\text{Bentonite } w = \frac{C_o}{2.2} + 6 = 438 - 33 \log N = 221 - 191 \log P$$

$$\text{Diatoms } w = \frac{C_o}{0.6} + 125 = 181 - 32 \log N = 159 - 24 \log P$$

$$\text{Quartz } w = \frac{C_o}{1.6} + 26 = 26 - 5 \log N = 23 - 2 \log P$$

Are small-area bearing tests an index of the supporting power of large areas?

► The moot question in the application of results of direct bearing value tests has been the effect of the size of the loaded area. Goldbeck and Bussard (*Public Roads*, January, 1925) found small settlements produced by the same unit load to be related according to the expression:

$$\frac{p}{P} = \frac{a}{A}$$

in which p is the settlement of area a.

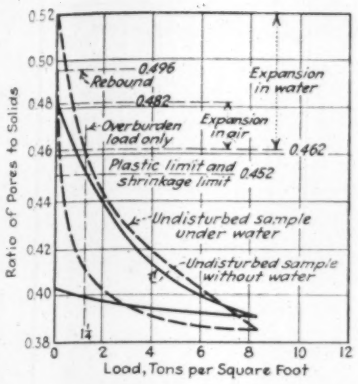


FIG. 10—LOAD-COMPRESSION and load-expansion curves, showing expansion of undisturbed-soil samples.

and P is the settlement of the area A.

A similar finding is reported by Folger (*Trans.*, A.S.C.E., 1933, p. 299) for his tests and also those performed in the field for direct compression by Henrick Press (*Die Bautechnik*, Sept. 26, 1930) and William H. Housel.

Prior, however, found that piers settled on yellow clay and blue clay 0.1 in. and $\frac{3}{8}$ in., respectively, when according to the Goldbeck formula they should have settled 1.45 in. and 5½ in. respectively *ENR*, Oct. 26, 1933. As a matter of fact, the settlement of the yellow clay was the same for areas of 0.4 sq.ft. and 85 sq.ft.

Terzaghi (*Trans*, A.S.C.E. 1929, p. 275) explains the seeming inconsistency of the above data by calling attention to the difference in the settlement properties of cohesive and cohesionless materials. (See also discussion by Besson, *ENR*, March 15, 1934, p. 345.) He suggests that settlements of the former follow those designated by the formula, while the size of the bearing area should have comparatively little effect on settlements of the cohesionless materials.

Prior inclines to a formula for bearing value suggested by C. C. Williams (*Trans.*, A.S.C.E. 1929, p. 309) and used also by Housel (*ENR*, Feb. 23, 1933). It is:

$$W = Ap + Lf$$

in which W = safe load on soil, A = bearing area, p = unit resistance to compression, L = length of perimeter, and f = unit resistance to shear at the perimeter.

Here the presence of shearing capacity causes the supporting power per unit of area to decrease as the area increases. However, as pointed out by Housel (*Engineering Research Bulletin No. 13*, University of Michigan, October, 1929): "As size of the footing is increased and the value of $\frac{L}{A}$ approaches zero, the bearing capacity approaches a constant value p, the strength of the pressure bulb and the perimeter shear f becomes negligible so that the same bearing capacity could be used for different-size footings without appreciable error."

Folger agrees that settlements for large areas are correspondingly smaller than those indicated by the formula. Gilboy (*Trans.* A.S.C.E., 1933, p. 232) also reaches the conclusion that: "Settlement under a given load, not too near the ultimate, is practically independent of the size of the loaded area," which idea represents current practice in the field of roadbuilding.

Is actual use of soil tests making progress?

► In highway work generally, subgrade investigations have passed from the experimental to the practical state. A survey made by division I of the committee on materials of the American Association of State Highway Officials in 1932 disclosed that thirteen states and the District of Columbia had laboratories equipped to perform all the routine tests employed by the Bureau of Public Roads in their soil investigations. There are at least seven more now. An equal number of the remaining states rely to some extent on soil tests or otherwise recognize the importance of subgrade consideration in the design of their roads and pavements.

Cast-Iron Block Pavement for Test Road in Minnesota

COPYING one of the blocks used in England, the University of Minnesota has laid a 30-ft. length of 24-ft.-wide pavement with cast-iron blocks on one of its campus streets. The experiment has been undertaken by E. W. Davis of the university school of mines, with the object of demonstrating the practicability in this country of using a type of pavement that has been meeting with considerable favor abroad, particularly in Great Britain. The accompanying view shows the experimental pavement in process of construction.

As indicated by the illustration, the blocks were triangular with diamond-shaped studs on the upper surface and were cored out and ribbed on the under side. They stood $1\frac{7}{8}$ in. high and were $11\frac{5}{8}$ in. on the sides at the top and $11\frac{3}{4}$ in. at the bottom. To square up the paved surface at the curb lines right and left, half blocks were used. The full blocks weighed about 11 lb. each. Altogether the 80 sq.yd. of pavement required 1,598 full blocks and 68 half blocks.

The blocks were laid on a concrete base on a ¼-in. bed of hot asphalt. They were spaced on 12-in. centers across the street and on 10½-in. centers lengthwise of the street. This spacing left open joints between blocks about ¼ in. wide at the bottom and about ½ in wide at the top; these joints were filled with hot asphalt. No difficulty was experienced in laying the blocks except for some flow of the joint filler due to the 6 per cent grade of the street.

LAYING CAST-IRON BLOCK PAVEMENT for test section of campus street at the University of Minnesota.

Advice for Contractors Entering Government Work

II—Law and the Contract are Supreme Arbiters

A preceding article of this series emphasized that errors of negligence in presenting bids do not relieve the contractor from full compliance with his bid

By Howard L. Jones
Cherrydale, Va.

IT IS very important in contracting with the government to know that the contracting officer has authority to bind the United States. Officers of the government act only within the scope of the limited authority given them, and any person entering into an agreement with such officers is charged with notice of the limitations upon their authority to bind the United States. The distinction between the liability of individuals and the government with respect to their agents is that the former are liable to the extent of the power they have apparently given their agents, while the United States is liable only to the extent of the power which it has actually conferred upon its agents by law, and the unauthorized acts of such agents cannot stop the government from declaring them invalid.

Standard contract form

There was approved by the President, Nov. 19, 1926, a standard construction contract for use on government construction work (Form No. 23), with the requirement that it be used throughout the government service. Those who contract with the government are put on notice by ¶ 2 of the instructions for preparation of the contract that "There shall be no deviation from this standard contract form * * * without prior approval of the Director of the Bureau of the Budget."

There should be noted carefully the provisions of the contract before it is signed. If there appears a material change in the standard contract form as printed, authority for such change should be shown. Always bear in mind that all prior negotiations leading up to the consummation of the contractual understanding are held to be merged in the written agreement. A contractor is bound by the agreement to which he has assented and, in the absence of evidence showing that his assent was influenced by fraud, violence or the like, he will not be permitted to say that he did not intend to agree to its terms.

Interpretations

The contract should be carefully examined for irregularities; as the legal interpretation of ambiguous provisions may destroy all of the profit on the undertaking. Some of the interpretations that have been given such provisions may serve as a warning. It is a general rule that where a provision in a contract and a provision in the specifications attached to and made a part of the contract are conflicting and irreconcilable the provision in the contract is controlling. The meaning of general words used in a contract is restricted by more specific and particular descriptions of the subject matter to which they apply. The reference to a schedule not a part of the contract does not modify or qualify any provision of the contract. It has been held that typewritten provisions will prevail over apparently contradictory printed provisions of the specifications. Nothing in the nature of trade customs or commercial usages may be accepted in the interpretation of a contract with the United States.

Restrictions

No officer of the government is authorized to enter into a contract whereby the United States is made to assume all liability in an indefinite amount for all damage or injury to persons or property. Such provisions are null and void. It has long been the policy of the United States not to insure its property. The government likewise does not act as insurer for a contractor for public buildings or public works. It is a provision of the standard contract that partial payments do not relieve the contractor from the sole responsibility for the protection of the work on which payments have been made or the restoration of any damaged work. A contractor with the government should make other provision for his protection.

It is a provision of Sect. 3732, Revised Statutes, that "No contract or purchase on behalf of the United States shall be made, unless the same is authorized by law or is made under an appropriation adequate to its fulfillment." Sect. 3733, Revised Statutes, says that "No contract * * * shall bind the government to pay a larger sum of money than the amount in the treasury appropriated for the specific purpose." Under Sect. 3737, Revised Statutes, "No contract or interest therein may be transferred."

The liability of the United States to pay interest exists only where it is authorized by express legislation. The deferring of contract payments beyond due dates because of insufficient appropriation will not obligate the government to pay carrying charges or interest thereon.

It is a provision of Sect. 3737, Revised Statutes, that no contract with the United States may be assigned, and it has been held that such right may not be included in a contract. This statute has been held to have no application where the contractor sold his entire business.

Public-works contracts

There was approved Sept. 7, 1933, a contract form (No. P.W.A. 51) to be used for public-works projects. This contract form embodies all of the provisions of the standard construction contract and, in addition, the following important emergency provisions:

The contracting officer may withhold from the contractor so much of accrued payments as may be necessary to pay laborers and mechanics employed by the contractor or any subcontractor the difference between the rate of wages required by the contract and the rate of wages actually paid.

It is required that there be inserted in the contract a minimum hourly wage rate, and also that a clearly legible statement of all wage rates to be paid shall be posted in a prominent and easily accessible place at the site of the work. The rates fixed in the contract are subject to change by the Federal Administrator of Public Works on recommendation of the Board of Labor Review. It is provided further that in the event of a change as above, "The contract price shall be adjusted accordingly on the basis of all actual labor costs on the project to the contractor, whether under this contract or any subcontract."

There are other important provisions such as: "So far as practicable and feasible in the judgment of the contracting officer" no individual directly employed on the project shall be permitted to work more than 30 hours in any one week, supervisory positions excepted. The maximum of human labor is to be used "whenever practicable and consistent with sound economy and public advantage." The contractor is required to furnish compensation insurance for its employees.

As a final warning, let us quote from a decision of the Supreme Court, 172 U. S., 379:

" * * * The written contract merged all previous negotiations and is presumed, in law, to express the final understanding of the parties. If the contract did not express the true agreement, it was the claimant's folly to have signed it."

Chemical Precipitation Advised for Twin Cities' Sewage

Engineering board reports that plain sedimentation, aided during summer months by chemical precipitation, will effect sufficient purification to meet requirements of state board of health

SEVENTY PER CENT treatment of the sewage of the Minneapolis-St. Paul Sanitary District is considered by the district's engineering board sufficient to meet state requirements for the condition of the Mississippi River below the discharge of the proposed sewage-treatment works. Plain sedimentation and chemical precipitation are the recommended methods to obtain the 70 per cent result, but the engineering board appointed by the district last July to determine the extent and method of treatment desires to have its findings reviewed by "one or more consultants of long and varied experience in sewage treatment." A preliminary report carrying these recommendations was presented to the trustees of the district on Oct. 29. The engineering staff of the district concurs in the recommendations of the engineering board, which consists of Col. C. W. Kutz, chairman, Prof. Frederic Bass and W. N. Carey, state PWA engineer.

The first major problem of the board was to determine the degree of treatment needed to restore the river to a satisfactory condition and to meet the state board of health requirements. These requirements are as follows: the public hazard shall be reduced to a minimum; the health of livestock shall not be materially in danger; the present public nuisance shall be eliminated; the fish life, at least below the mouth of the St. Crois River, shall not be jeopardized. It was agreed that dissolved oxygen should be maintained at or about 2 p.p.m. for 90 per cent of the time of each of the summer months of the average year, above 1 p.p.m. for short periods and always above zero. There is no obligation to do more than meet these standards. Thus dilution by river flow becomes an important factor.

A continuous flow record of the Mississippi is available since 1892. Flow has varied from 59,700 to 864 sec.-ft. in 1934. The average monthly flow for June, July, August and September for the 43-year period is 10,690 sec.-ft., but a critical period of low discharge has existed from 1931 to 1934. Rainfall records back to 1837 indicate that there have been twenty comparable droughts. The dry-weather domestic sewage flow of the two cities, as of 1945, for which the proposed works are to be designed, is 134 m.g.d., based on an estimated 147 gal. per capita from 910,000 population. Suspended matter is expected to be 185 p.p.m. and the B.O.D. 200 p.p.m.

Plain sedimentation, reducing the oxygen demand by 33⅓ per cent, would have been sufficient treatment for 90 per cent of the 1912-1920 period, but secondary treatment to effect a reduction of 70 per cent would have been required in the four summer months of 1931 to 1934 inclusive. The method to be used, the report states, therefore lies between plain sedimentation at 33⅓ per cent B.O.D. reduction and activated sludge at 92 per cent. Two methods were considered: (1) plain sedimentation plus chemical precipitation for the entire flow; and (2) activated sludge for 40 m.g.d. and plain sedimentation plus chemical precipitation for 94 m.g.d.

Both plans provide for a coarse screen at the entrance to the plant, followed by a fine screen and grit chambers. From the grit chambers the sewage will flow through venturi meters to tanks which will serve as flocculating tanks if the chemical process of secondary treatment is used. If and when the activated sludge process is installed for part of the flow, one of these flocculating tanks may be used for re-aeration of activated sludge or as skimming tanks.

Ten clarification tanks, 15 ft. deep of 10,000-sq.ft. area, would be used in method 1 as primary clarifiers having a 2-hour detention period. In method 2 these would function as secondary sedimentation tanks, and all will have sludge-collecting mechanisms.

Both methods will include sludge-digestion tanks, storage tanks, sludge-washing tanks and vacuum filters for dewatering the digested sludge. No provision is to be made now for incinerators, as a relatively large treatment plant site, 450 acres, exists for wasting the dewatered digested sludge. Except for the activated-sludge effluent, both methods would require chlorination of the effluent to meet the public health requirements of the state board of health.

In making up cost estimates it has been assumed that secondary treatment would be used for two months, although on the average it is needed only 10 per cent of the time. In the accompanying table a third method is estimated: 84 m.g.d. by activated sludge and 50 m.g.d. by plain sedimentation.

In discussing the chemical process the engineering board states as follows: "The great advantage of chemical processes lies in the ease and economy with which they may be adjusted to meet the needs of varying stream conditions. In addition to greater flexibility, the initial cost is relatively small. If, under average river conditions, the secondary treatment is to be in operation only 10 per cent of the time, these considerations have great weight.

"On the other hand, there is no chemical plant in operation in this country comparable in size to the Twin Cities' plant, 134 m.g.d., and the results of experiments at different places and the operating results at existing chemical plants cannot be regarded as a sure indication of what can be accomplished by chemicals in a plant with sewage flows ranging from a dry-weather flow of 134 m.g.d. to a storm flow of 610 m.g.d.

"While there is uncertainty as to the quantity of chemicals that will be required to secure the degree of purification indicated as necessary, the cost of making provision for occasional or intermittent chemical dosage is so small that this method should not be ignored. If it fails to measure up to expectations, no part of the investment will be lost, as it will form a useful part of method 2."

Cost comparisons, seconding to the report, show clearly that the intermittent load requirements can be met most economically by chemical precipitation, and that the additional investment of $1,800,000 in an activated-sludge plant at this time to treat part of the flow is inadvisable, even though a 30 per cent federal grant is available now and may not be in 1945. However, the board, because of the large capital costs and several unprecedented features involved in the problem, recommended further "comment, criticism and advice" before the sanitary district makes its final decision.

C. C. Wilbur is chief engineer of the Minneapolis-St. Paul Sanitary District, and J. A. Childs is sanitary engineer. Available data on which the engineering board reported on treatment were largely the work of Mr. Childs.

COST ESTIMATES OF THREE METHODS OF TREATING MINNEAPOLIS-ST PAUL SEWAGE TO PRODUCE A 70 PER CENT B.O.D. REDUCTION 90 PER CENT OF TIME

	Original Cost	Annual Costs: Fixed Charges	Annual Costs: Maintenance and Operation	Annual Costs: Total
Plain sedimentation plus chemical precipitation	$3,241,000	$194,500	$285,200	$479,700
Activated sludge, 40 m.g.d.; plain sedimentation plus chemical precipitation, 94 m.g.d.	5,034,000	302,000	301,800	603,800
Activated sludge, 84 m.g.d.; plain sedimentation, 50 m.g.d.	5,923,000	355,400	308,900	664,300

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Sewage Treatment for the Twin Cities

OF MORE THAN passing interest is the recommendation by the engineering board of the Minneapolis-St. Paul Sanitary District that plain sedimentation aided during the summer by chemical precipitation be adopted as the treatment method to be employed in the district's proposed sewage-treatment plant. If the recommendation is concurred in by the experts whose review is requested by the board, the new plant will be the largest plant in this country for the chemical treatment of sewage. Sanitary engineers have displayed intense interest in chemical methods for several years, but no installations of major magnitude have yet been made. In making its recommendation, the engineering board recognized the lack of performance data from chemical treatment plants of comparable size, but it contends that the cost of providing equipment for intermittent chemical dosage will be very small and that if operation should prove the method uneconomical the remainder of the plant would lose none of its utility by being converted into an activated-sludge plant. Thus the long-evident subsurface trend toward less-than-complete treatment of sewage comes out into the open, backed by a strong economic argument. The engineering world will do well to follow closely the sewage-treatment developments in the Twin Cities.

The Price of Hurry

TOO FREQUENTLY engineers find themselves faced with the problem of inaugurating the actual construction of a project for which they have not had an opportunity to make complete studies and plans. Bonneville Dam on the Columbia River, described last week, is an example. In order to study the possibilities of the site, the army engineers some years ago made a preliminary exploration of the underlying rock and prepared tentative plans for a dam, power house and navigation lock as part of a general report upon the development of the Columbia River. But no funds for complete exploration of the site were available at that time, nor had any been provided when, about a year ago, the PWA decided to include Bonneville Dam in its program of federal construction and urged immediate undertaking of the project in order to provide work before winter set in. As a result, a grading contract was let for work at a site that subsequently was shown to be less desirable than one farther down the river. That contract now has been cancelled, the design of the dam has been modified, and work is under way at the site that would have been selected had opportunity been provided for complete examination of the terrain. The price of the hurried start is the work wasted in the abandoned site. Invariably such is the case. Executive officers, unfamiliar with engineering requirements, order work started on the assumption that preliminary sketches indicate that their engineers know enough about the site to start construction. The frequency with which this happens raises the question as to whether engineers are not in part to blame because they have not made it clear to the executive officers that their studies are only preliminary.

Collarbuttons and Microscopes

STANDING OUT AS CURIOUS even among the countless strange schemes for ending the depression that have been put forward and quickly forgotten, the fantastic plan of voluntary production-increase by all industries that was advocated recently by William Green arouses interest. If business recovery can be accelerated by deliberately proceeding to make more collarbuttons and microscopes, the head of the American Federation of Labor may be on the right track; but the chances are that it cannot. Mr. Green in proposing the plan displayed less practical sense than has marked most of his statements on depression conditions. It would be more to the point were he to recognize publicly the harm done by the still-continuing epidemic of strikes and the part played by labor-organizer activities in initiating them. That progress upward can be made only through united effort is tacitly acknowledged in the Green plan itself; but there is unlikely to be much united effort so long as flying-squadron labor warfare gives unmistakable proof that some elements wilfully pursue a way of their own.

Functional Building Design

ADHERENTS of that modern school which embraces the belief that contemporary buildings must include nothing that may be considered hereditary and everything or anything that expresses what has been termed functionalism should visit Schenectady, N. Y. There, in an industrial building—a mercury-vapor power and steam plant—they would encounter what must be the most perfect example of the art. For nothing can be more functional than machinery itself, and this plant is fundamentally an assembly of equipment with only just enough building enclosure to assure the operators weather protection. Like its early ancestors, the old stationary construction boiler with a shanty built at the firebox end, this new plant is readily adaptable to an increase in capacity by merely adding another unit. It has no dark and sooty attic spaces where roof trusses corrode unnoticed. It probably has no more outdoor surface to be kept painted than would a conventional industrial building. In appearance, it is striking and dramatic because it is unusual; perhaps for the same reason it has an esthetic appeal not usually associated with industrial structures. As an example of functional approach to industrial building design, this General Electric power plant has no equal.

A Valuable Contribution

BEHAVIOR AND CONTROL of subgrade soils have become essential considerations in roadbuilding. This trend has its inspiration primarily in the increased knowledge which the recent research of soil physicists has given of the reaction of soil, as a foundation material, to temperature and moisture. An associated motive is that research laboratory workers have developed, besides the determination of general principles of soil action, various processes of soil testing capable of common use. Any

highway department can today possess all the instruments and direct all the processes required for a working knowledge of its common subgrade soils. This fact, obscured to a large extent by the greater publicity given to general research activities, is clearly brought out in this issue by engineers of the Bureau of Public Roads. It will come as a surprise to many engineers, we think, to find how far their brothers in the roadbuilding field have progressed in the means for applying soil research to their work. A more practical gain from the article is that it puts the men of the highway department laboratories in touch with the latest devices and practices of the modern soil-testing laboratory. It is seldom that an article is presented with so many references to sources of information verifying and elaborating the argument and facts that it presents; and, therefore, as a compendium of references to source materials, the article has a value beyond its own authoritative text.

Advising Government Contractors

CARRYING OUT contracts with the government has always been a troublesome problem. It is the same today. Formerly competition for federal public works construction was confined to a limited group of contractors who specialized in that class of work and were familiar with all the laws governing federal contracts and all the practices of federal contracting agencies. Today government work is almost the only construction going on, and so every contractor must learn what these laws and practices are. Moreover, to the old laws and regulations Congress has added by its various recovery acts a whole group of new federal public-works laws, administrations and regulations, puzzling even to the contractor long experienced in this class of construction. The beginner in federal construction therefore simply flounders in confusion.

These conditions do not mean that federal contracts are blind or unreasonable. In general they are fair, and those who administer them are fair. They are merely fixed by law and fiat that bind both the contracting agent and the contractor. The informal give and take of the ordinary private-contract agreement does not exist. Changes and concessions involve formal procedure that is as obligatory upon the federal engineer directing construction as upon the contractor who executes the work. The letter and word of federal contracts and contract law and regulation have a finality that prevails in few other construction-contract agreements.

In clarifying this broad generality the half-dozen articles of advice for contractors entering government work, the second of which is published in this issue, are of great timeliness. The author writes with exact knowledge of the laws and decisions of which he speaks, and his statements should be read with care. A sentence often conveys a fact that reaches broadly and deeply into a ruling or practice whose observance counts largely in the success of a contract. In brief space the author condenses a wealth of suggestion for dealing with the government authorities who are directing the present large and varied construction operations involving federal funds.

In considering his words of advice the reader can well afford to look more deeply into the principles that account for the guards and checks with which government contracting has hedged itself about. All are directed to secure and insure that free competition which is the vital element of an enduring policy of construction by contract. Any easing of rigid enforcement of the terms of the written rules endangers a principle which benefits contracting far beyond any benefit that would accrue by greater ease in securing individual concessions. The government contractor should think well before he urges change in policies of federal contracting that will open the gate to favoritism and political influence from which present practices have proved to be generally an effective protection.

The Motor Car Pays Its Way

AN AGENCY that contributes a billion and a third dollars a year to the tax income of the country, as did motor vehicles in 1933, is not asking charity when it demands continued roadbuilding. Conceding that the tax payments for 1933 as reported on another page were temporarily inflated, it is certain nevertheless that in normal years these taxes count up to a round billion dollars annually. This is more than highway contruction and upkeep have cost in any year of the last three—and these years include the enormous federal grants for unemployment relief by roadbuilding.

In the face of such a tax contribution, any charge that motor-car transportation is being tax-subsidized by publicly financed highways does not deserve credence. The question of equity is whether transportation is receiving a road service at all equivalent to the toll it is paying. It is not receiving a fair equivalent if it gets only the upkeep of existing improved roads; a large volume of new construction must be added to balance the road-tax ledgers.

New construction is not being adequately provided even with the large emergency gifts of the federal government and their restriction by law to construction. The states have not done their share during the last three years in financing new construction.

And this deliquency on the part of the states comes about not because motor-car transportation has not paid its road taxes but because state executives and legislatures have diverted road-tax money to doles and the support of other administration agencies. In a measure the new federal-aid highway act will curtail this depletion of highway funds, but many states will be in a mood to take the penalty of reduced federal aid and get along with less highway construction unless the present mental attitude of the public is changed.

Under these circumstances the battlefield of the road user for needed highway improvement must extend to every state. Winning appropriations from Congress will not win the war for continued highway construction adequate to the public needs. The road users must make their urgency felt in every state and county by organized effort; and direction of this effort lies in the hands of the associations of the roadbuilding industries.

If road-construction programs are to go ahead in the future at a speed at all approaching that of pre-depression days, new popular sentiment and enthusiasm have to be created. This is vital. Any argument based merely on the claim that the profitable livelihood of the roadbuilding industry depends on highway extension will not bring to legislators and administrators the conviction of necessity.

CURRENT NEWS

Failure of Steel Penstock Under Test at Hawk's Nest Hydro Plant Kills Five Men

ON THE morning of November 1 during a test of the steel manifold and penstocks of the Hawk's Nest hydro-electric plant of Electro Metallurgical Co. on the New River near Gauley Junction, W. Va., a failure occurred in a manifold branch leading to one of the five 14-ft. penstocks. The failure resulted in the death of five men who were engaged upon the test, four of whom were workmen in the employ of The Babcock & Wilcox Company, contractor for the manifolds and penstocks, and John W. Hall, resident engineer for Hugh L. Cooper & Co., consulting engineers for the project. Two other engineers, one on the staff of The Babcock & Wilcox Company and the other on the staff of the Electro Metallurgical Co., who also were inspecting the test, met with only minor injuries.

The main penstock and manifold is about 320 ft. long and varies in diameter from 30 to 14 ft. There are four branches from the main stem, three leading each to a 14-ft. penstock and the fourth dividing into two 14-ft. penstocks. The manifold and penstocks are all electric welded and required about 16,000 lin.ft. of weld. All welds were stress relieved, and were x-rayed wherever possible.

The testing, which included standard hydrostatic and hammer tests, had been in progress since October 22 following the installation of numerous dial indicators and the placing of marks to determine the behavior of the structure. During the tests the work had been subjected to hydrostatic pressures up to that of the maximum static and computed water hammer, and, after the repairs of two small leaks that developed under hydrostatic pressure, had for three periods totaling nine hours successfully withstood the maximum water hammer pressure without the slightest leakage or evidence of weakness. Between two of such periods and during a hammer test one plate developed a crack which was repaired by welding and the penstock was then tested satisfactorily under the maximum hydrostatic pressure.

During the subsequent hammer test, which was made under a hydrostatic pressure equivalent to that of the maximum water hammer pressure at the upper end of the 30-ft. penstock, and somewhat less than that at the lower end of the last penstock, about 95 per cent of the welded joints had been tested, apparently satisfactorily. Less than 900 lin.ft. of weld, all on the upper three branches, remained to be tested.

No warning of break

Without warning, while the hammer test was being applied to the under side of the No. 3 branch in that portion which leads to the 14-ft. penstock, a break occurred. This break was irregular in shape, about 12½ ft. long with a maximum width of 6½ ft. There was no evidence of a failure of the welds, as the rupture was all in the plate metal except where it touched the welds or crossed them at right angles.

A careful investigation is now being made to determine the exact cause of the rupture.

John W. Hall, killed in the accident reported above, was born in Mazeppa, Minn., in 1885 and began his engineering career as an instrument man on the Boston & Albany R.R. at Boston in 1905. Subsequently he was with the Boston Elevated Ry. and with Stone & Webster on power plant construction. From 1908 to 1911 he studied engineering at Harvard, working on railway and subway work during vacations. After graduation Mr. Hall was with the Downey Irrigation Co. in Idaho for a few months and then became chief of party for the Mississippi River Power Co. on the construction of its power plant at Keokuk, Iowa. Since that time Mr. Hall had been associated with the firm of Hugh L. Cooper, Inc., consulting engineers, first at Keokuk, Iowa, then at Muscle Shoals, later on the Dniepsrostroy plant in Russia, and more recently on the Hawk's Nest plant in West Virginia.

Inspection of Washington Shaft Discloses Cracked Facing Stones

Inspection of the Washington Monument, made possible by a $100,000 PWA allotment, has disclosed considerable cracking in the marble facing blocks. The detailed survey, made possible by the steel scaffolding which has been built around the monument, shows that lightning, sun, and wind have produced distinct signs of surface damage. Some of the blocks have been shattered in several directions by lightning bolts; others have cracks attributed to the heavy loading; still others have not been able to withstand the swaying of the monument.

Despite the cracks, including the large ones cutting completely through the marble, the monument is safe, the engineering report indicating the deterioration was not dangerous if halted. The damaged blocks are merely the facing for the real structure, which is of granite built in walls as much as 15 ft. thick most of the way up.

Where blocks have cracked all the way through, engineers attribute the destruction to the slight swaying of the monument in high winds. The heating effect of the sun also causes the structure to move as much as 2.6 in. to the north at the tip. Up near the apex lightning has shot through some of the blocks which will require repair.

Demolition Begins on Site of Third PWA Housing Project

The Public Works Administration's slum clearance and low-cost housing program advanced further into actual construction stages last week with the award of a contract for demolition on the Montgomery, Alabama, project. Montgomery is the second city in which demolition of a slum area to be replaced by a low-cost housing project has been put under way. First demolition was started at Atlanta, Georgia, on the Techwood and University projects there. Demolition of the University project is expected to be completed within a few days, while Techwood will follow shortly.

Title to the Montgomery site is vested in the United States government. The project, to cost approximately $200,000, will consist of 162 row houses for Negro occupancy, located along Thurman St., across from the Alabama State Normal School for Negroes.

Illinois Society of Engineers Added to National Society

The Illinois Society of Engineers has been admitted as a member state society to the National Society of Professional Engineers by unanimous vote of the board of directors of the national body. The Illinois organization, which is 40 years old, has 445 members.

The registration law for Illinois applies to structural engineers only, and the Illinois society is now actively interested in securing a comprehensive registration law for all professional engineers in the state. For this reason, the national society has agreed to classify Illinois as a state not yet having a comprehensive registration law for professional engineers, because otherwise all professional engineers of the state, other than structural, would have to be classified as sub-professional and be ineligible for membership in the national society.

Work Started on $2,600,000 Dam and Power Project in Texas

Construction operations are under way on the Red Bluff dam on the Pecos River about 50 miles north of Pecos, Tex., following approval of the $1,330,000 main contract by PWA authorities. The project includes an earth-fill dam, hydro-electric power plant and transmission system estimated to cost $2,600,000, financed by a PWA allotment. It is the largest single PWA project in Texas to reach the actual construction stage.

Work at the site includes camp buildings for the crew of from 250 to 500 men, and a power line from Pecos costing $70,000. The general contract between the Red Bluff Water Control and Irrigation District is held by S. J. Groves and Sons, Minneapolis. This firm has sublet various phases of the work.

PWA to Permit Work to Continue on Philadelphia Subway

TO PREVENT 400 employees of Builders, Incorporated, Philadelphia, from being thrown out of work, the PWA has consented to withdraw its demand upon the Delaware River Joint Commission that the subway contract be terminated. The contractor will be permitted to proceed with the construction of the subway from Eighth and Race Sts., to Sixth St. and an underpass in Fifth St., on the condition that defective work will be remedied and all violations of PWA labor and wage regulations corrected; also that the joint commission will immediately reorganize its engineering supervision and inspection staff. The PWA order for immediate termination of the contract was reported last week (*ENR*, Nov. 1, p. 569).

The joint commission has agreed to make no payments to the contractor without prior written consent of the PWA and also withhold $25,000 from the amount now due to meet back wages as determined by the PWA labor board of review. Complaints brought by the PWA inspection division were heard by the labor board Nov. 1. The evidence includes affidavits by employees performing carpentry work on the project that they were classified as wood form setters at 75c. an hour instead of skilled carpenters at $1.20. Bricklayers presented a demand that they be paid $1.50 an hour as the prevailing rate in April, 1933. Saw filers, cement finishers and concrete rubbers asked that they be classified as skilled labor.

Correspondence Exchanged

In a letter (Nov. 2) replying to the PWA demand for termination of the construction contract, the Delaware River Joint Commission stated to Major Philip B. Fleming, acting deputy administrator:

"As we have explained to you in the conferences that we have had, we prefer not to terminate our agreement with Builders Incorporated because such action would throw out of work for a considerable period of time a large number of men now gainfully employed, would delay the completion of the project and might result in long and costly litigation.

"We request the PWA, therefore, to withdraw its demand that we terminate this agreement. If this is done, we assure you that we will immediately cause to be corrected all departures from the plans and specifications and all labor and wage violations on the project; that we will immediately reorganize our engineering supervision and inspection staff in a manner satisfactory to the PWA; that we will see to it that the work is constructed in full compliance with the plans and specifications and PWA rules and regulations; that we will in all respects cooperate fully with the PWA.

"We further agree that if the PWA accedes to our request, we will withhold the sum of $25,000 from the amount now due from us to Builders, Inc., to meet back wages due laborers and mechanics and that we will make no payments at any time to Builders, Incorporated, without prior written consent of the Public Works Administration.

"Should the PWA decide to withdraw its demand to terminate our agreement with the Builders, Incorporated, we further agree that if at any time the PWA informs us that all matters pertaining to said agreement have not been adjusted to its satisfaction and requests us to terminate such agreement, we will then take immediate steps to do so."

Subsequently, Major Fleming said:

"Pursuant to the policy of PWA to keep men employed, we have acceded to the request of the Delaware River Joint Commission to withdraw our demand that its contract with Builders, Inc., be terminated.

"We did this only after the Delaware River Joint Commission agreed in writing to our other demands, among which were correction of defective work, that funds be withheld from Builders Inc., until these corrections are made and that the commission reorganize its inspection force in a manner satisfactory to PWA.

"There is no reason why the workers should not return to their jobs at once and continue to work until the project is completed.

"If any interruptions occur it will be solely by reason of the failure of the commission to live up to its agreement."

Bituminous Road Material Code Is Approved by NRA

The code of fair competition for the Bituminous Road Material Distributing Industry has been approved by NRA. A code authority, consisting of nine members, six of whom are to be members of the National Bituminous Road Material Distributing Associates, and three non-members of the association, is provided with the additional prerogative of adding three non-voting administration members. The code authority is empowered to fix a budget for expense and to establish a basis of contribution. For the purpose of administration, the country is divided into nine regions, and a regional authority may be established in each or all of these.

Harvard Engineering School to be Restricted to Graduates

A reorganization in engineering instruction at Harvard University, to become effective in 1935-1936, provides that undergraduate instruction in engineering will no longer be given in the engineering school, but will be done solely by the division of engineering sciences in the college, using the same equipment and under the direction of the same officers. The administrative change is in conformity with the recent tendency for the majority of engineering students to obtain under-graduate instruction through the college rather than registering as under-graduates in the engineering school.

The engineering school will be continued on a strictly graduate basis as the Graduate School of Engineering, with courses in the several branches leading to degrees of Master of Science in Engineering and Doctor of Science.

Highway Research Board to Hold Annual Meeting December 6-7

The fourteenth annual meeting of the Highway Research Board will be held in Washington, D. C., December 6-7. Among the general topics listed for discussion are: Highway transportation economics, tractive resistance, highway design, low-cost roads, materials and construction, maintenance and traffic.

Open sessions of the committees on economics, design, materials and construction, maintenance and traffic, will be held on the preceding day, December 5.

WEST END OF MIDTOWN TUNNEL READY FOR AIR

Driving of the New Jersey end of the Midtown vehicular tunnel under the Hudson at New York will soon settle down to routine operations under compressed air. As this view shows, the concrete bulkhead and air locks at the ventilation shaft are in place. In the right center is the material lock; the man lock is at the upper left, and the third lock in the bulkhead, high in the bulkhead and used only for emergencies, is out of range of the picture. Tunneling operations were carried riverward from this shaft for several hundred feet of solid rock. The shield was then erected and the cast-iron lining placed the full length of the excavated section. The next step will be to place the tunnel under compressed air and start the shield into the river silt. Muck-handling equipment shown here is temporary, as construction from this shaft will be stopped in a couple of months to permit work to start on the ventilation building. A construction shaft is being sunk riverward from this shaft, from which tunneling operations will be conducted. On the New York side the tunnel is still in rock, and the ventilation shaft caisson, out in the river, is being sunk under compressed air.

Establishment of Area Agreements Proceeds Under Code

AFTER much delay in evolving administrative procedure, the providing of mutual or area agreements under the construction code, establishing standards of hours of labor, rates of pay and other conditions of employment in specifically defined areas or regions, has begun to produce tangible results. Indications point to approval of area agreements at an increasing rate, with populous centers fairly well blanketed with agreements before the next construction season.

The procedure for effectuating area agreements has been decentralized so far as is possible, and yet maintain control in the construction section of NRA. Hearings now scheduled are to be conducted by NRA compliance directors in the immediate territory. Deputy Administrator R. E. Doherty under whom this work is centered has personally conducted hearings to familiarize the compliance directors with the procedure before placing the responsibility in their hands for conducting the public hearings.

Wages and hours

Provisions of the area agreements already approved are of interest as indicative of the trend in rates of pay and hours of employment. The mason contractors' agreement for New York City and part of Long Island provides a basic 40-hour week with 8 hours a day for 5 days a week, and a basic rate of $1.50 per hour if one or two shifts are employed; but if three shifts are employed the basic rate is paid only on the first shift and the second and third shifts are paid at the rate of 8 hours for 6 hours work.

The painting, paperhanging and decorating area agreement for Philadelphia and vicinity similarly provides a 40-hour week with a basic rate of 85c. per hour in Philadelphia County and 80c. per hour in the surrounding territory. Night shifts, or work performed between 5 p.m. and 8 a.m., are paid wages 10c. higher per hour, and overtime or time spent working over the regular hours, is paid twice the basic day time rate.

Chicago area

The electrical contractors area agreement for Cook County, Illinois (Chicago), also provides a 40-hour week with differential rates of pay. On new construction work $1.50 per hour is specified; $1.00 per hour for maintenance work; and $1.06¼ on modernization or rehabilitation work. Overtime rates are 1½ times the regular rate of wages for the first 3 hours over 8 hours; and twice the rate of wages for regular hours thereafter.

The plumbing contractors area agreement for Denver, Colorado, provides a 35-hour week. The basic rate of pay is $1.142 for regular work and twice that rate for overtime. On regular work of 35 hours per week the weekly income is $40 per week as contrasted with $44 per week for 40 hours work at $1.10 per hour as fixed in the plumbing contracting chapter; this provision is superseded by the area agreement. The reduction in hours per week from 40 to 35 is accompanied by a reduction in pay of approximately 9 per cent.

Under the construction code, minimum skilled labor rates are specified in only four chapters. The plumbing, heating and piping, and plastering contractors covered by Chapters X, XVI and XX, respectively, specify PWA rates according to the three zones, i.e. Southern, Central and Northern at $1.00, $1.10 and $1.20 per hour. The electrical contractors' chapter, Chapter VI, fixes a minimum rate of 75c. per hour for the entire United States. These minimum code rates, however, are applicable only where no area agreements have been approved. Consequently the electrical contracting work performed in Cook County, Illinois, and plumbing contracting work in Denver, Colorado, would be at the rates described above, rather than at the minimum rates specified in the code.

Construction Preliminaries Advance at Grand Coulee

Preliminary operations on the $29,000,000 contract of the Mason-Walsh-Atkinson Kier Co., for building the Grand Coulee Dam, are advancing rapidly. In spite of dire predictions by local river men, the company recently floated a raft of piling downstream about 125 miles from Kettle Falls through rapids and swift water to hasten construction on a temporary trestle bridge across the river. The arrival of this piling permitted an earlier start on this bridge, which was completed in two weeks. The bridge eliminates need for ferrying all men and equipment across the river prior to the completion of the permanent steel structure.

Foundations for the 550-ft. cantilever bridge near the damsite (*ENR*, Oct. 25, 1934, p. 519) are nearing completion. This structure was designed by the Washington department of highways, and will be built under the direction of the Bureau of Reclamation. The low bid for the superstructure was made by the J. A. Pomeroy & Co., Inc., of San Francisco, at a figure of $258,978, if freight charges are paid by the contractor. These bids were opened October 18.

At the site of the contractor's main camp, which has been named Mason City, a dining hall seating 1,000 men has been completed, and a fully equipped 40-bed hospital will be started soon.

New Orleans Will Start Work On $2,500,000 Sewerage Project

With the conclusion of legal formalities to permit the concluding of a $2,250,000 PWA loan and grant to the New Orleans Sewerage and Water Board, bids for construction have been scheduled for opening on Dec. 27, Jan. 3, 10 and 17. Construction work on the project, according to Bryson Vallas, general superintendent of the board, will be actively under way the latter part of January, 1935.

The PWA contract has been approved by the board, and similar action by the city council commission and board of liquidation of the city debt is expected shortly. The loan is to be secured by bonds to be liquidated by unpledged revenues of the sewerage and water board.

Mortgage Insurance Plan of FHA Goes into Effect

INTENDED to enable more people to buy and pay for their own homes by spreading the cost and reducing financing charges, FHA's mortgage insurance plan will commence operation Nov. 15. The new legal basis provided by the National Housing Act also is designed to attract capital to this field of investment under conditions described as favorable to building up a nationwide mortgage market, as all insured mortgages must conform to standard specifications.

The insurance plan applies to homes, old and new, for 1 to 4 families. The aggregate mortgage liability that will be insured in both cases is $1 billion. Because the insured mortgage dwellings must be economically sound, only loans on well located city property are eligible for insurance. The builder of houses for sale is not barred if he qualifies otherwise as an eligible mortgagor, but FHA appears reluctant to advertise the fact at present because of the damage that might be done to its program by prejudiced public opinion.

Feature of plan

The fundamental feature of the plan is complete insurance of mortgages running up to 20 years for $16,000 but not over 80 per cent of the appraised value of the property. On the financing of new homes eligible for insurance the top interest rate is 5 per cent plus a service charge of ½ of 1 per cent and an insurance premium of ½ of 1 per cent. President Roosevelt insisted on the uniform rate although aware that "in the beginning this may cause less response on the part of lenders and investors in some sections of the country." In line with common practice, FHA's inclination was to permit rates to vary between 5 per cent and 6 per cent, the limits fixed by the new law for insured mortgages.

Five per cent plus an insurance premium of ½ of 1 per cent but no service charge is the limit of financing sale, or resale, without change of lender on houses built prior to June 27, 1934. On refunding of present mortgage on existing property the maximum interest rate is 5½ per cent plus an insurance premium of 1 per cent and a service charge of ½ of 1 per cent with change lender, none with no change of borrower or lender. The insurance premium must be paid annually on the original face value until the mortgage is fully paid off. All that is not required to pay insurance losses and administrative expenses, however, will return in the form of a credit on the principal.

Minneapolis Gets 4.55-in. Rain; Mississippi River Rises 1.2 Ft.

A near-record rain of 4.55 inches fell at Minneapolis October 20 which resulted in serious damage to much of the city's wood block paving. The storm which was general over the Northwest following a month's period without precipitation resulted in a raise of 1.2 ft. in the Mississippi River at Hastings, Minn., which is the most abrupt rise in several years at this gaging station.

Midwest Engineering Progress

Ashland Avenue bridge started in Chicago—Milwaukee filter plant site ready for unwatering and city water rate questioned by large users—Four PWA projects start on Michigan Peninsula

(Special Correspondence)

CHICAGO, Oct. 31.—With many smaller PWA projects nearing completion in the Middle West states, municipal officials are wishfully looking forward to the possibility of a replenishment of PWA funds to carry out further work. Many high grade projects remain on the list.

Assurance of $2,814,000 of federal funds for Calumet Harbor is bright. PWA receded from its demands to make movable the seventeen bridges on the main channel of the Sanitary District and will allow three to be fixed. A 160-acre housing site has been chosen by PWA on the near west side and an information office opened on the ground. The water department convicted a laundry for stealing water through gear "adjus ment." The Chicago Rapid Transit Company has been ordered to restore its structure burned in the stockyards fire. Gas tax and license fees in the state are now obligated to pay $160 million for other than road uses. Cook County will have a deficit. The Ashland Ave. bridge, a PWA project linking sections of a widened street, has been started, but resumption of work on the Outer Drive bridge over the mouth of the Chicago River still awaits financing. Legalization of the consolidation of 22 parks into a single unit is hoped to make possible issuance of collateral acceptable to PWA. Filtration for the south side area is still alive.

Milwaukee and Wisconsin

In Milwaukee County where 93 taxing bodies with 464 public officials appoint or employ 13,000 employes and spend $63,000,000, consolidations are to be voted on at November election. Pay-as-you-go enthusiasts in the city of Milwaukee are objecting to issuing school building bonds and other objectors to special assessments for street widening are tending to throw the whole burden on the city as a whole. "Boil-the-Water" notices were back for a week after many years' absence because all the sewage was diverted into the lake while connections were made to the new addition to the Jones Island disposal plant.

The 12-acre filter plant site in Lake Michigan has been inclosed in a sheet piling cofferdam ready for unwatering. The water department has made its usual annual contribution to the general fund, $880,000 this year. Its 6-cent flat rate is under fire by large consumers. Loss of the activated sludge patent suit has been followed up quickly by steps to collect, with officials subpoenaed to bring in the records. In a recent report, proposing salary and classification revisions, the engineers' schedule was found to check fairly well with that of the Am.Soc.C.E.

In the state of Wisconsin the following are noted: Horizon Marsh is to be given back to the birds and beavers, the drainage project has lost out. Racine has started to add four new filters to its sewage plant. Shorewood has proposed a 5-year public works program. South Milwaukee was ordered by the state railroad commission to cease furnishing "free" water. Wauwatosa has removed its waterworks superintendent because he built a poor well—and hired a plumbing inspector.

Detroit and Michigan

As a $6,000,000 housing program is about to get under way controversy has arisen as to whether the 1,500 to 2,000 employees are to be local men. Options are being taken on four times as much land as needed to forestall excessive costs. A $600,000 elevated roadway in Grand Blvd. over four downtown streets is proposed.

Kalamazoo city manager has three apprentices from nearby colleges. The upper peninsula starts four PWA projects totalling $1,116,000; largest is the Menominee power plant. The $30,000,000 bridge project over the Straits of Mackinac is still alive. Michigan, like Illinois, has substituted a sales tax for property tax and finds it exceeds expectations as a revenue producer. Plymouth rebuilds its city hall with relief labor rather than build a new one. City manager cities have smaller per capita tax in 1932 than mayor-council cities, $19.02 against $21.15. The new state Public Works Commission is considering the question of pollution of the Detroit and St. Clair Rivers first. Michigan, paying $200,000,000 to the federal government in taxes, is contemplating its $16,000,000 of PWA allotments, of which $13,000,000 are for highways.

Louisiana Court Allows Damages For Inadequate Highway Culvert

A judgment granting $3,490 damages has been affirmed by the Louisiana Supreme Court on the claim of a farmer against the Louisiana Highway Commission, because a highway structure interfered with drainage on the claimant's land. The record of the case showed that the highway commission had replaced an open trestle bridge in Bossier Parish with culverts, and subsequently the plaintiff's crops had been damaged by floodwaters which were not able to escape through the culverts with sufficient flow. The open bridge, it was shown, provided 2,086 sq.ft. of area, while the culverts had a corresponding waterway area of 565 sq.ft. The judgment of the lower court for damages of $3,470 had been appealed by the highway commission, the defendant in the case, and the higher court affirmed the decision and added $20 to the judgment.

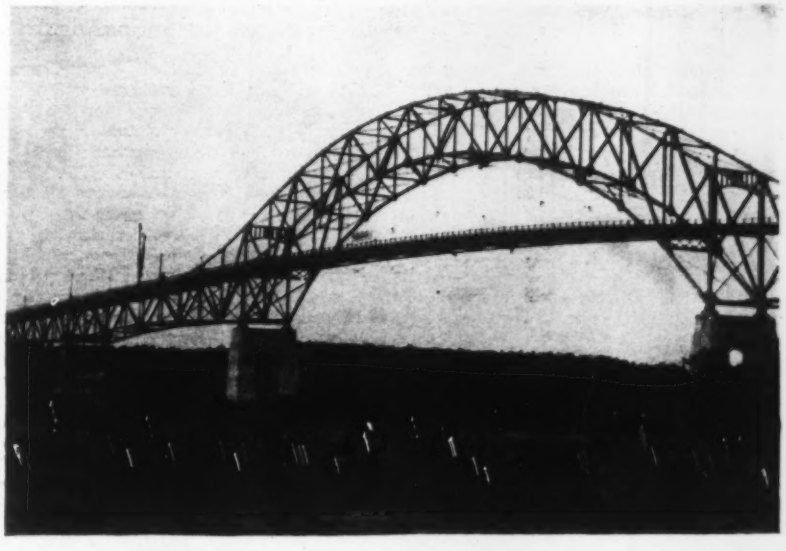
Texas Engineers Discuss State Licensing Legislation

State legislation for licensing professional engineers was discussed at the closing session of the recent meeting of the Texas Section, American Society of Civil Engineers. The subject will be discussed further at the next session of the directors, to be held next month, to consider the possibility of establishing a legislative committee to study the subject and present recommendations for future action.

FIRST OF CAPE COD CANAL BRIDGES ERECTED

With the weighing of the dead load reactions of the continuous truss section of the highway bridge at Bourne, Mass., on October 30, the first of the three new Cape Cod Canal Bridges is complete and ready for the paving of the floor. The reactions were measured by ingenious use of proving rings such as are used commonly to calibrate testing machines. The bridge consists of a 616 ft. main span flanked by 396 ft. spans in a three-span continuous truss arrangement, and with two simple truss approach spans at either end. The other highway bridge, at Sagamore, is a duplicate of the three-span continuous bridge at Bourne and has no approach spans. The third bridge, a railroad structure at Buzzards Bay, comprises a vertical lift span of 544 ft. Steel erection commenced at Sagamore about the time it was completed at Bourne.

The bridges are being built by the Corps of Engineers. Fay, Spofford & Thorndike, Boston, designed the highway bridges, and Parsons, Klapp, Brinckerhoff and Douglas, New York, the railroad bridge. Foundation contractors are the Blakeslee-Rollins Corp., Boston, and P. J. Carlin Construction Co., New York. The American Bridge Co. is erecting the highway bridges, and the Phoenix Bridge Co. will erect the railroad bridge.



Overlapping Code Assessments to Be Aired At Public Hearing Scheduled for Nov. 15

THE National Recovery Administration has announced a public hearing in Washington, D. C., on Nov. 15, 1934, on the applications made by ten divisional code authorities of the construction industry for termination of the administrative order which exempts a member of any industry from the obligation to contribute for code administrative expense other than to the code authority embracing his principal line of business. The divisional authorities for the painting, paperhanging and decorating division, roofing and sheet metal division, mason contracting division, kalamein division, wood floor division, insulation contracting division, terrazzo and mosaic division, plastering and lathing contracting division and the building granite division are seeking to terminate the exemption of employers not embraced in such divisions of the industry as their principal line of business, but who, nevertheless, perform the functions outlined in these chapters.

These applications have, in part, resulted from the interpretation made by the National Recovery Board, Oct. 12, indicating that Administrative Order X-36 applied to various divisional and sub-divisional chapters of the construction code as well as to other codes. That decision (*ENR*, Oct. 18, p. 508) made as a result of the controversy between the general contractors and mason contractors, established the fact that a member of the construction industry whose principal line of business is general contracting, if performing his own masonry work, is not liable to assessment by the mason contractors divisional code authority for code expense. The general contractor would be obligated to contribute if the application by the mason contractors is granted by the NRA.

Annual board meeting

The annual meeting of the National Construction Planning and Adjustment Board was held at Washington, Nov. 8 and 9. Consideration was given to the establishment of regional boards to handle not only labor disputes, but labor complaints. A committee reported recommendations with respect to establishing minimum rates for skilled labor through area agreements or otherwise.

Court Blocks Purchase by TVA of Knoxville Power System

After weeks of hearing before the state utility commission and a number of contests in state and federal courts the plan of the Tennessee Valley Authority to purchase the electrical distribution system of the Tennessee Public Service Co. in Knoxville, was blocked last week by a state court decision giving a group of nonresident ice and coal dealers 90 days in which to prepare their case attacking the constitutionality of the act setting up the TVA. As the TVA agreement with the bondholders of the Tennessee Public Service Co. for the purchase of the distribution system expired on Oct. 30 an entirely new agreement will have to be reached before the TVA can go ahead with its plan to purchase the system and use it to distribute its power in Knoxville. On the other hand, a federal court, in an entirely separate action, improved the chances of such an agreement being consummated by refusing the plea of a minority stockholder for a restraining order to prevent consummation of the sale. The same court in its decision appeared to hold that PWA funds could be used to build a distributing system should the deal between the TVA and the Tennessee Public Service Co. fail.

Blocking of the sale has renewed activity in the plans of Knoxville to build its own distributing system with a PWA loan which still is available if required.

Seattle Power Department Advances Plans to Extend Service

Seattle's municipal power and light department, through J. D. Ross, superintendent, has instituted a program of territorial expansion which would ultimately include the taking over of the properties of the Puget Sound Power & Light Co. throughout the western counties of the state. These properties are valued, according to Mr. Ross' figures, at $95,000,000. There has been no active response on the part of the municipalities in the wider areas to indorse this program.

According to Mr. Ross, if demand for widespread extension of the municipal system is not assured by the interest of outside towns, the plan would be to take over the private companies' properties within the city limits of Seattle as a preliminary step. He was opposed to this separation in the process of taking over the Puget Sound properties, because of the necessity of paying severance damages in addition to the intrinsic value of the property.

Water Shortage at Denver Causes Restrictions for Sprinkling

The Denver Board of Water Commissioners voted October 25 to prohibit use of the city water supply for sprinkling after November 1. Violators of the order will have their water service turned off, and may face court action. The restriction resulted from the serious depletion in the storage available in the three reservoirs operated by the department. The three main reservoirs (Cheesman Lake, Eleven Mile Reservoir, and Marston Lake) which have aggregate normal capacity of 160,000 acre-ft., contain, according to report, only 20,000 acre-ft. at the present time. Although there was no wish to alarm the city, the water officials are reported to have stated, that unless heavy precipitation occurs on the adjacent watershed during the winter the situation would be very acute for the coming season. The water supply behind the Cheesman Dam is now the lowest on record for this time of year.

Activated Sludge Plans Discarded by Washington

Plans for the $8,000,000 activated sludge plant for the District of Columbia have been discarded in favor of a $4,000,000 plant for treatment and disposal of sewage by plain sedimentation. The change was made pursuant to an agreement reached between PWA Administrator Ickes and Col. Dan I. Sultan, engineer commissioner of the district. Metcalf & Eddy, of Boston, have been working on the plans, under an informal arrangement with the District, and can complete them 6 weeks after the loan and grant agreement with PWA is formally executed.

The district will receive the customary grant of 30 per cent of the cost of labor and materials and repay the remainder at the rate of $1,000,000 a year. As the loan is to be interest free for three years, the district probably will not have to pay any interest charges whatever.

Sedimentation will effect 30 per cent instead of 90 per cent purification claimed for the activated sludge method. Substitution avoids the immediate issue raised by the U. S. Supreme Court's decision sustaining validity of the activated-sludge patents and apparently does not preclude utilization of this process after the patents expire in 1936.

"Additions to the plant to provide more complete treatment may be necessary in the future," said Col. Sultan. "The project to be undertaken immediately will provide a functioning, useful work to meet present requirements. Complete treatment is not deemed advisable at this time in view of the many other demands for money and the desirability of keeping down the tax burden. The spending of money should be confined to present needs. The money now to be spent will not be wasted in any event as it will be possible to enlarge the plant."

Calculator Developed to Solve Simultaneous Equations

Completion of an experimental model of a mechanical calculating machine for the solution of simultaneous equations has been announced at the Massachusetts Institute of Technology. The device was designed by John B. Wilbur of the civil engineering department under the direction of Vannevar Bush, vice-president of the institution. The new machine reproduces, with the aid of pulleys and steel tapes, the mathematical conditions of the equations to be solved. A second proposed model, already designed, will contain about 1,000 ball-bearing pulleys and over 500 ft. of stel tape, but will be only 2 ft. wide, 2½ ft. high and 7 ft. long. A total of 110 vernier scales enables the setting of the various coefficients and constants of ten equations, while ten angular verniers enable the operator to read the solutions directly.

It is expected that the machine will be useful in such problems of civil engineering as the design of tall buildings to resist wind and earthquake forces, and the adjustment of triangular networks forming a horizontal control for precise surveys. Further development will proceed with the objective of increasing the number of equations which can be solved in a given period by the use of the machine method.

Brief News

IN THE THREE YEAR period since the opening of the George Washington bridge across the Hudson River, New York, the structure has been used by 17,600,000 vehicles. There has been a steady increase in traffic and the last 12-month period indicated a 7 per cent increase in traffic over the previous similar period.

ABOUT TWO MONTHS will be required for the completion of working plans for the new $2,500,000 post office building to be built at Buffalo, N. Y.

THE HIGHWAY DEPARTMENT of the province of Quebec will undertake surveys and plans for a new road 150 miles long extending into the region north of Lake St. John as another step in the opening up of the northern part of the province.

FIGURES RELEASED by the New York Division of Highways indicate that 159 contracts are under way at the end of October with 7,113 men employed on these jobs. During the season 5,333,730 sq.yd. of pavement have been completed, representing 390 miles of work. The maintenance force maintained by the state department includes 4,864 men.

PLANS FOR A NEW $100,000 marine building to be built by the Canadian government in Victoria, B. C., are nearing completion and bids will be called soon to permit work to start before the end of the year.

THE FOUR MAIN TRACKS of the Canadian National Railways which carry the main line traffic in and out of Montreal are undergoing complete rehabilitation, including rock-ballasting, improvement of grade crossings, and a new drainage system. About 300 men are employed on this work.

A HIGHWAY LINK connecting northern Pennsylvania with Philadelphia and New York, called the Effort Mountain Road, was put into service Oct. 31. The development cost $726,000 and reduces the distance between Wilkes-Barre and Philadelphia from 140 to 119 miles.

A PROPOSAL for the issuance of bonds for the reconstruction of the Pasadena, Calif., Junior College and three high schools, at a cost of $375,000, was approved by Pasadena voters on Oct. 26. The proposal was adopted by a vote of 9,593 to 4,432, giving a margin of 243 votes over the two-thirds necessary for adoption.

Obituary

FREDERICK PARKER SPALDING, consulting engineer, died at Dracut, Mass., October 29, at the age of 80.

WILLIAM F. MCGUIRE, consulting engineer and at one time partner in the firm of George W. Goethals & Co., died October 29 in New York City. He was 62 years old and had been retired for several years.

JOHN E. HILL, professor of sanitary engineering at Brown University, died suddenly at his home in Providence, R. I., on Nov. 2. He was born in New York City in 1864; educated at Rutgers College and Cornell University. From 1890 to 1894 he was an instructor at Cornell and in the latter year joined the staff at Brown.

CONSTRUCTION STATISTICS OF THE WEEK

Closing the construction reports one day early as a result of the election day holiday is partly responsible for the heavy drop in engineering construction contracts reported this week as compared with last week's unusually high total. Contracts for the current week aggregate $19,519,000, which is less than half the previous week's total of $39,922,000. Federal awards, mostly for flood control and waterways projects, are slightly higher than last week; all other classifications are lower. Cumulative contracts to date this year, $1,102,470,000 are 27 per cent ahead of last year.

Large contract awards for the week include cement purchases for Norris and Wheeler dams, $2,203,000; dredging at Brazos Island, Tex., $1,372,000; part of Fort Peck Dam Spillway excavation and waterproofing, $1,168,000; sewers for Westchester County, N. Y., Sanitary Sewer Commission, $517,000; hospital buildings for city of San Francisco, $669,000; and highway work for Montana, $728,000.

State and municipal bond sales for the week total $3,753,000, consisting largely of a $2,000,000 highway bond issue sold by the state of New Jersey.

CONTRACTS

(Thousands of Dollars)

	Weekly Nov. 1933	Average Prev. 4 Weeks	Week Nov. 8 1934
Federal Government	$10,554	$3,199	$5,711
State and municipal	14,238	19,164	11,074
Total public	$24,792	$22,363	$16,785
Total private	4,739	3,903	2,734
Week's total	$29,529	$26,266	$19,519
Cumulative to date: 1933	$867,747	1934	$1,102,470

NEW PRODUCTIVE CAPITAL

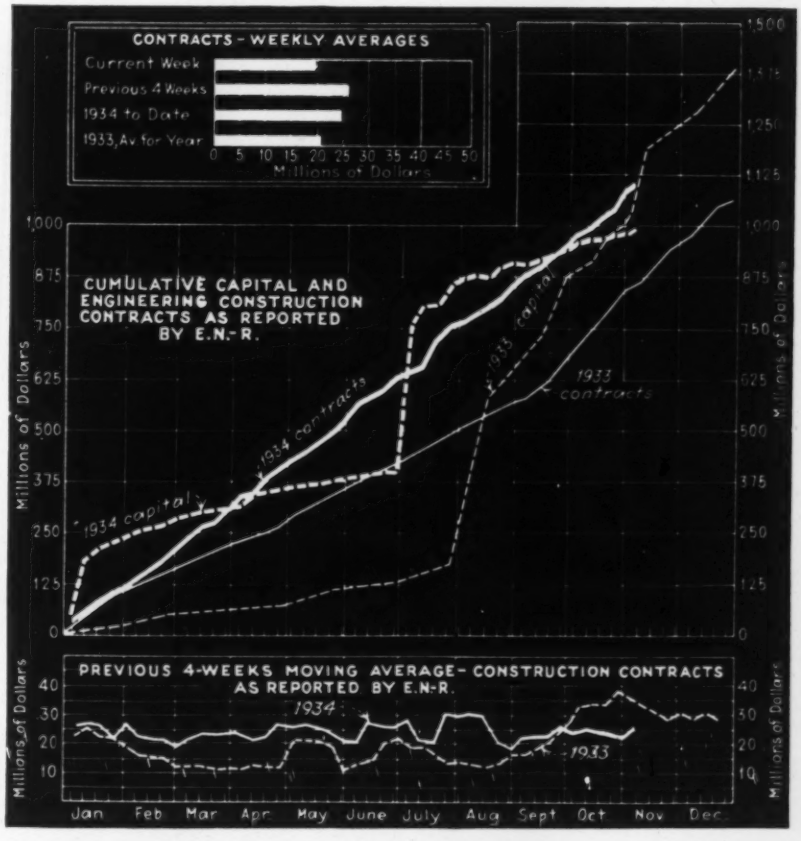
(Thousands of Dollars)

1934	Week Nov. 8	Cumulative
State and municipal	$3,753	$286,038
PWA allotments, S&M	....	606,863
RFC loans, S&M	....	25,463
Corporate issues	....	18,256
PWA allotments, private	....	57,022
Total, Non-Federal	$3,753	$993,642
PWA allotments, Federal Constr.	....	193,525
Total new capital	$3,753	$1,187,167
Cumulative to date: 1933	$1,187,195	1934	$993,642

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.

INDEX NUMBER

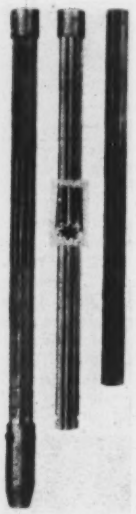
E.N.-R.- Cost	1913 = 100	1926 = 100	E.N.-R.- Volume	1913 = 100	1926 = 100
Nov., 1934	201.36	96.76	Oct., 1934	98	43
Oct., 1934	200.86	96.55	Sept., 1934	101	44
Nov., 1933	190.14	91.40	Oct., 1933	162	71
1933 (Av.)	170.18	81.80	1933 (Av.)	102	45
1932 (Av.)	156.97	75.45	1932 (Av.)	127	56
1931 (Av.)	181.35	87.17	1931 (Av.)	220	96.5


CONTRACTS - WEEKLY AVERAGES
Current Week
Previous 4 Weeks
1934 to Date
1933, Av for Year
0 5 10 15 20 25 30 35 40 45 50
Millions of Dollars
CUMULATIVE CAPITAL AND ENGINEERING CONSTRUCTION CONTRACTS AS REPORTED BY E.N.-R.
1934 capital
1934 contracts
1933 capital
1933 contracts
Millions of Dollars
0 125 250 375 500 625 750 875 1,000 1,125 1,250 1,375 1,500
PREVIOUS 4-WEEKS MOVING AVERAGE - CONSTRUCTION CONTRACTS AS REPORTED BY E.N.-R.
1934
1933
Millions of Dollars
10 20 30 40
Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec

Construction Equipment and Materials

Self-Jetting Well Point with Fluted Tube for High Capacity

A new self-jetting well point of unusual design has been placed on the market by the Complete Machinery and Equipment Co., Webster Ave. and Hancock St., Long Island City, N. Y. The point consists of a fluted tube, around which is placed an octagonal strainer of No. 60 brass gauze and a perforated cover of 20-gage brass sheeting. At the top of the fluted tube is welded a coupling for connecting with a standard 1¼-in. riser pipe. The bottom of the point is fitted with a jetting head containing a ball valve.



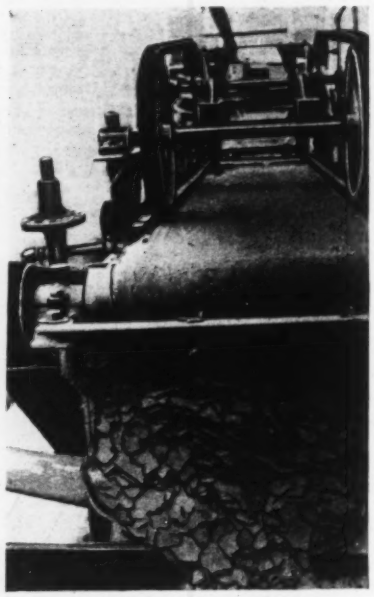
New well point

The point is jetted down by pumping water into it, during which time the ball valve unseats, permitting the jetting water to pass out through the bottom of the head. When suction is applied to the point, the ball valve closes, keeping out all unstrained water. Water is drawn through the full length of the strainer, and passes down the outside of the fluted tube to the bottom, whence it enters the inside of the tube for discharge through the riser pipe. This feature maintains the suction on the point until water is drawn down to the level of the bottom of the strainer. No special jetting apparatus is required, and as the point assembly is light in weight, jetting and handling do not require the services of a crane. A special pump has been designed by the company for use with the new point. Riser and header pipes are furnished if desired. The header is standard 6-in. tubing fitted with quick-coupling connections. Welded inlets are set 3 ft. apart for connection to the points. Ease in jetting and high capacity in operation are principal claims made for the new point.

Horizontal Belt Filter For Sludge Dewatering

A horizontal belt vacuum filter for dewatering sludge, pulp, slime, concentrate, etc., has been announced by the Canadian Locomotive Company, Ltd., Kingston, Ont. The machine consists of a vacuum deck or a series of stationary vacuum boxes over which is carried a ported belt or suction mat. This ported belt, which is generally similar to an endless conveyor belt, is the means by which the vacuum is carried from the vacuum boxes through the filter media to the sludge or other material.

The sludge is carried down the length of the machine on a filter cloth which travels at the same rate of speed as the suction mat. At the dry end of the machine the filter cloth leaves the suction mat, passes over a discharge pulley, discharging the cake and then returning by means of rollers to the top of the suction mat at the feed end.



Canadian Locomotive Company's horizontal belt vacuum filter.

The deckle belts form a trough to hold the material on the filter cloth until such time as the material is dried enough to become a solid cake.

The suction mat on which the filter media is carried is of a special high grade moulded rubber. Water seals along both sides of the vacuum ports act as vacuum seals and serve to lubricate the mat as it passes over the suction boxes. The manufacturer states that the total power consumption of the machine is low.

New Equipment in Brief

Flame Cutting Machine. The Airco-DB tractograph, a new oxy-acetylene cutting machine manufactured by the Air Reduction Sales Co., New York, N. Y., is said by the manufacturer to provide a simple means for accurately cutting steel plates and slabs into shapes having straight, circular or irregular outlines. It is intended for the cutting of plates and slabs up to 2 in. thick. It is a small, compact, motor-propelled unit capable of traveling at any speed from 2½ in. per min. As it travels, it is guided by hand along the desired contour.

Compressor. Schramm Inc., West Chester, Pa., have announced the "Utility" compressor, a new compact light-weight machine. The compressor is mounted on a two-wheel pneumatic tired trailer. The sizes available are the Model 25, having a capacity of 18 cu.ft. actual air delivery, and Model 55, with 38 cu.ft. actual air delivery.

New Publications

BARCO PORTABLE GASOLINE HAMMER, Barco Mfg. Co., Chicago, Ill. 8½x11, 6 pages.

DIESEL ENGINE, STATIONARY TYPE, Ingersoll-Rand, New York, N. Y. 8½x11, 20 pages.

MILBURN OXY-ACETYLENE APPARATUS, The Alexander Milburn Co., Baltimore, Md. 3½x6, 34 pages.

MITCO PRODUCTS, Hendrick Mfg. Co., Carbondale, Pa., 8½x11, 20 pages. Open steel flooring, Shur-Site tread and armor grids.

AIRCO-WILSON ARC WELDING MACHINE, Air Reduction Sales Co., New York, N. Y. 8½x11, 8 pages.

STANDARD AND HEAVY DUTY BLOWERS, Roots-Connersville Blower Corp., Connersville, Ind. 8½x11, 8 pages.

STORY OF THE BOULDER DAM—PART 4, Ingersoll-Rand Co., Phillipsburg, N. J.

THE GROUND HOG, 50th anniversary number, Marion Steam Shovel Co., Marion, Ohio. 8½x11, 24 pages. A special issue of the Marion house organ signalizing the company's 50th anniversary.

GOOD ROADS CHAMPION SNOW PLOW, Good Roads Machinery Corp., Kennett Square, Pa. 8½x11, 32 pages.

INCINERATION AND THE SEWAGE DISPOSAL PROBLEM, Combustion Engineering Co., Inc., New York, N. Y. 8½x11, 16 pages.

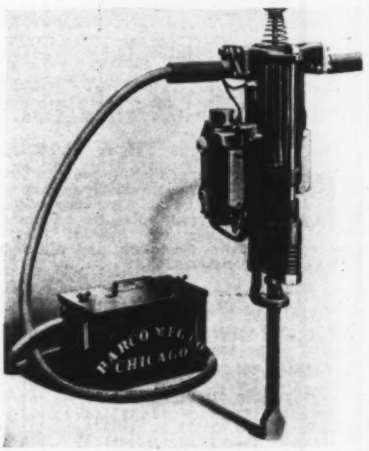
Portable Gasoline Hammer Consists of Single Unit

The Barco Manufacturing Co., Chicago, Ill., has announced the Barco gasoline hammer, a portable demolition tool, which is built into a single unit consisting of a single-cylinder, air-cooled engine, operating on the two-cycle principle with gasoline tank attached to the cylinder and with fuel capacity for two hours of continuous operation. The ignition is supplied to the spark-plug from a 9-volt battery.

To start the engine a small rod at the top is pushed down, forcing the piston to the bottom of its stroke. On the return stroke the suction draws a sufficient charge of gasoline and air into the lower cavity. The second downward push of the piston transfers this charge through a by-pass to the explosion chamber. The second return stroke compresses this fuel mixture, operates the timer, and causes the explosion, and from then on each cycle is automatic. The entire piston is hardened and the lower end, coming in contact with an anvil at the bottom of each stroke, delivers the blow which the anvil transmits to the head of the tool, which is held in place by a tool guide.

The new hammer weighs 89 lb. The manufacturer states that there is no loss of operating efficiency when the hammer is used in other than a vertical position.

Barco portable demolition tool



CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

Ark., Bentonville—City, W. R. Duncan, councilman, soon takes bids waterworks system. Est. $60,000. P.W.A. project. Black & Veatch, Mutual Bldg., Kansas City, Mo., engrs. Noted June 12.

Ark., Hardy—City soon takes bids waterworks system. $33,000. Application for P.W.A. loan and grant approved at Washington. H. R. Carter, National Standard Bldg., Little Rock, engr.

Ark., Pocahontas—J. O. Burrow, mayor, soon takes bids waterworks improvements. $32,000. P.W.A. project. Tentatively approved in Washington. Dickinson & White, Rector Bldg., Little Rock, engrs. Noted Aug. 9.

Colo., Boone—Formation of district being completed, to arrange $13,000 self-liquidating loan for materials and to seek $27,000 grant of FERA funds for labor, making $40,000 for water system and 2 mi. pipeline. J. W. McDonnal, Pueblo, engr. C. Jones, Sr., citizen's committee. Noted Aug. 30.

Kan., Argentine—Shawnee Co. soon takes new bids water supply system, south of here. Former bids returned unopened. $215,000. Chas. A. Haskins & Co., 517 Finance Bldg., Kansas City, Mo., engrs.

Mass., Northboro—Town Bd. Selectmen, Town Hall, indefinitely postponed construction of water filtration plant and steel standpipe. Weston & Sampson, 14 Beacon St., Boston, engrs. Noted Oct. 4.

Mo., Monett—City will not improve waterworks. Bonds defeated and $32,000 P.W.A. loan and grant allotment given up. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, engrs. L. W. Adams, city engr. Noted July 12.

Mo., Southwest City—City voted $27,000 for waterworks system. A. C. Moore, Post Office Box 305, Joplin, engr. Noted Feb. 15.

Ore., Reedsport—City soon takes bids 17,384 lin.ft. 12 in. c.i. pipe line. $36,000. P.W.A. funds allotted. E. H. Ford, mayor. Noted Nov. 9.

Okla., Ardmore — Defeated $27,000 bonds, waterworks purification plant and $34,000 bonds, sewers, disposal plant, etc. S. P. Mathews, city engr. Noted Oct. 11.

Okla., Checotah—City soon takes bids waterworks, $60,000. P.W.A. project. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo., engrs. Noted Sept. 6.

Tex., Gatesville—City, c/o Secretary, election Nov. 20, $60,000 for water and light plant improvements. P.W.A. project. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, engrs.

Tex., Stockdale—City, c/o J. E. Wheeler, pres. Chamber of Commerce, plans constructing municipal waterworks system, incl. deep well, pumping unit, tank and tower, distributing lines, meters, fire plugs. $18,000. P.W.A. loan granted. Engineer, c/o city.

Tex., Streetman—City bids after Nov. 15, waterworks system, incl. dredging out small lake, 75,000 gal. elevated steel tank and 75 ft. tower, pressure filters, pumping station, 10,000 ft. 8- to 16-in. c.i. pipe distributing lines. H. R. F. Helland, Frost Bldg., San Antonio, engrs. **P.W.A.** Noted Aug. 16.

Tex., Whitesboro—City, c/o W. R. Younger, mayor, rejected bids Oct. 26, waterworks improvement, incl. 2 pumping plants, elevated tank, water treatment plant and small dam. $26,000. Will readvertise for new bids soon. P.W.A. project. F. J. Von Zuben, 820 Fair Bldg., Fort Worth, engr. Noted July 12.

BIDS ASKED

Ala., Fairhope—Nov. 16, by Town Council, Town Hall, water system, consisting of 225,000 gal. concrete reservoir, well, 75,000 gal. tank and tower, service pump, fire pumps and 8 in. and 6 in. c.i. pipe, together with all valves, fittings, hydrants and appliances. P.W.A. project. J. B. Converse & Co., Inc., State Office Bldg., Mobile, engrs.

Fla., Pensacola—Nov. 20, by City, for waterworks improvements, incl. 500,000 gal. elevated water tank, 1,500 tons pipe and fittings, laying 12 mi. pipe and fittings. P.W.A. project. O. J. Semmes, Jr., city engr. Plans and specifications from J. E. Frenkel, city clk. Noted Aug. 31.

Ill., Decatur—Nov. 26, by City, O. W. Smith, mayor, waterworks, $95,000. P.W.A. project. Warren & Van Praag, Milliken Bldg., Decatur, engrs.

Ill., Springfield—Nov. 19, by City Comrs., City Hall, erecting water purification plant, incl. 40,000 cu.yd. excav., 3 mi. southeast of here; lime conveyor, 8 tons per hr. capacity, gages, instruments, flow recording and liquid level recording, filter equipment, filter bottoms, sand and gravel, furnishing, installing c.i. pipe, valves, wash water pumps, sludge pumps, installing freight elevator, 6 rate-of-flow controllers and chemical feed machines, $375,000. Burns & McDonnel, Kansas City, Mo., engrs. P.W.A. project.

Ind., Union City—Nov. 20, by City, improving waterworks, incl. ground water supply, piping connections, switchboard and wiring, turbine type well pumps, high service pumps, elevated storage tank, $34,000. P.W.A. project. C. Hurd, 1039 Architects Bldg., Indianapolis, engr.

Ky., Eddyville—Nov. 15, by B. H. Smith, city clk., City Hall. Contr. 1, extension of distribution system, filtration and pumping plant, concrete reservoir and intake in river; Contr. 2, either 75,000 gal. steel tank on 60 ft. tower or 75,000 gal. steel ground tank. P.W.A. project. J. S. Watkins, 610 Citizens Bank Bldg., Lexington, engr.

†Mass., Scituate—Nov. 15, by Public Works Officer, Building 39, Navy Yard, Boston, constructing water supply main, 4 in. transite pipe from Humarock to Naval Direction Finder Station, incl. connections at both ends, fire hydrant, valves, fittings, etc., Spec. 7816.

Mont., Billings—See "Contracts Awarded."

Tex., Anna—Nov. 20, by City, waterworks, $22,000. Noted July 26.

Tex., Glen Rose—Nov. 19, by City, c/o City Secretary, constructing 1 pumphouse and fire station complete; furnishing 1 corporation tapping machine complete with appurtenances, for City, c/o F. L. Williams, mayor. J. Rady, 400 Majestic Bldg., Fort Worth, engr.

Tex., Wells—Nov. 26, by City, c/o J. H. Dubose, mayor, waterworks improvements, incl. well, pump, motor, surface reservoir, elevated tank, distribution system, fire hydrants, $20,000. P.W.A. project. J. Rady, 400 Majestic Bldg., Fort Worth, engr. Noted July 26.

LOW BIDDERS

Calif., Los Angeles—Bd. Directors Metropolitan Water Dist., F. E. Weymouth, engr., 306 West 3rd St., Oct. 31, construction of cut and cover conduit, precast and monolithic siphons, steel pipe siphons and appurtenant works of Colorado River Aqueduct in Riverside Co., comprising about 30.5 mi. aqueduct construction, from Mittry Bros., 5531 Downey Rd., Sched. 18 and 18 A, $833,915***from J. F. Shea Co., Mecca, Sched. 19, $1,113,757; Sched. 19A, $77,170; Sched. 20, $545,915***from American Concrete & Steel Pipe Co., Southgate, Sched. 18K, $572,070; Sched. 19P, $128,876; Sched. 20K, $482,827; Sched. 20P, $901,073***from Morrison Knudson Co., 411 West 5th St., Sched. 23 and 23A, $1,165,105***from Dimmitt & Taylor, 815 East 59th St., Sched. 22, $159,730***from Western Pipe & Steel Co., 5717 Santa Fe Ave., Sched. 18S, $596,838***from A. Teichert, 1846 37th St., Sacramento, Sched. 21, $346,013. No bids on Schedules 18 P, 21 P and 22 P. Acceptance of stipulation would make H. M. Baruch, 625 South Olive St., low on Schedules 21, 22 combined at $499,730. Noted Oct. 25.

CONTRACTS AWARDED

†Calif., Livermore — Superintendent Constr. U. S. Veterans Hospital, Palo Alto, laying and finishing complete water line under Arroyo Del Valle, for Veterans Hospital, to Bennett & Taylor, 1978 South Angeles St., Los Angeles. $5,500. Bids Oct. 15, awarded Oct. 24.

Conn., Weston—See "Unclassified."

Ill., Greenfield—City, waterworks, and distribution system, to G. D. Harding Constr. Co., Chicago, $51,471 with machines; $53,829 by hand labor. Est. $79,000. **P.W.A.** Bids Oct. 23. Noted Sept. 27.

Ill., Homewood—Village water softener and storage tank on Lots 11 and 12, Hartford Sub., to Sides Constr. Co., 84th and Rush Sts., Chicago, $43,371. **P.W.A.** Consoer, Townsend, Older & Quinlan, 205 West Wacker Dr., Chicago, engrs.

Kan., Welborn—Quindaro Twp. water supply system, to Smith Bros. Constr. Co., New York Life Bldg., Kansas City, Mo., $138,300. **P.W.A.**

Ky., Shepherdsville—City Clerk, distribution system, also filter plant, 50,000 gal. steel tank, 100 ft. high, and river intake for waterworks, to Henry Bickel Co., Louisville, $21,575 and $38,023 respectively (tentative award.) Bids Oct. 22. Municipal Eng. Co., 518 Citizens Bldg., Louisville, engrs.

†La., Alexandria—Camp Beauregard, Dist. E, Citizens Conservation Camps, drilling and basing one 6 in. water well and equipping same with compressor, engine and fittings at C.C.C. Camp La. F-6, near Winfield, to L. A. Blevins, Glenmora. Bids Oct. 22.

†*Federal Government.*

For official proposal advertising see Searchlight Section

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Buildings:

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Commercial 185
Industrial 185

Federal Government projects are classified under heading denoting type of work and designated by symbol of †.

◆

Mass., Georgetown—Town, Bd. Water Comrs., Town Hall, Contr. 3, 1 story, basement, 50x52 ft. pumping station and water treatment plant, to Byron L. Moore, 43 Maple St., Framingham. Alternate "B" $18,622***Contr. 4, furnishing 2 low lift and 2 high lift pump and controls, to Turbine Equipment Co. of New England, 80 Federal St., Boston, $5,500. **P.W.A.** Bids Oct. 19.

Mo., Memphis—City, filter equipment, to E. W. Bacharach Co., Rialto Bldg., Kansas City, $7,050. W. B. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, engrs.

Mo., Paris—City, 100,000 gal. tank on tower for waterworks, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $8,890; watermain extensions, to E. J. Fischer Co., 4134 Westminster Pl., $8,675. **P.W.A.** Bids Oct. 26. Noted Oct. 18.

Mont., Billings—City water supply system, incl. two 1 m.g. chlorinators, high surface pump pit, day labor. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs. Noted Aug. 23.

N. J., Cape May—Mayor and City Council, erecting water tank, to Tibbertt & Wood, Philipsburg, $41,875. **P.W.A.** Bids Oct. 9. Noted Oct. 4.

N. J., New Brunswick—City Comm., watermains to A. Stanley Mundy Co., Inc., Woodbridge, $64,400***equipment, to Roberts Filter Mfg. Co., Darby, Pa., $64,700***constructing filter plant, to Industrial Eng. Co., 50 Church St., New York, $82,500***structural steel, to Elizabeth Iron Wks., Elizabeth, $1,834***heating, to Richardson Eng. Co., 127 Franklin St., New Brunswick, $5,200***lighting, to P. H. Jaehnig, Inc., 221 13th Ave., Newark, $470. Grand total $199,104. Bids Oct. 23.

N. Y., Almond—Municipality, waterworks, Contr. D, steel standpipe, to Buffalo Tank Corp., 153 Lincoln St., Buffalo, $3,184. **P.W.A.** Noted June 7.

N. Y., Buchanan—Municipality, waterworks, pipe, valves, boxes Contrs. 1 and 4, to Florence Pipe & Fdry. & Machine Co., Florence, N. J., $41,208***construction, to Riccio Bros., Inc., 25 Orchard St., Harrison, $30,568***valves, hydrants, meters, Contrs. 2, 3 and 5, to Levinson & Peiffer, 120 North James St., Peekskill, $8,690. Grand total $80,466. **P.W.A.** Bids Aug. 31.

N. Y., Elba—City, constructing waterworks, Contr. F, to A. H. Stapleton, 54 East Ave., Akron, $24,245.

N. Y., Plandome—Municipality, pump houses and pipe lines, Schedules A and C, to A. G. Bancker, Inc., 67 Orchard St., Manhasset, $18,524***wells and pumping equipment, Schedule B, to C. W. Lauman & Co., Inc., Central Park, $13,050***storage tank and gallery, Schedule D, to Suburban Eng. Co., 15 West 38th St., New York, $16,268. Grand total $47,841. **P.W.A.** Noted Mar. 22.

N. Y., Sharon Springs—City, water supply, to B. Trimpoli, 251 Altamont Ave., Schenectady, $39,408. **P.W.A.**

O., Ashtabula—See "Sewerage and Waste Disposal."

Wis., Platteville—City Water Works Comm., generator and pump (deep well) to Worthington Pump & Mchy. Corp., 400 West Madison St., Chicago, Ill., $29,950 and $4,420 respectively. Bids Oct. 12.

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SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Ark., Batesville—N. A. Langley, city recdr., soon takes bids sewerage system extension, $43,000. W. R. Heazler, Paragould, engr. P.W.A. project. Noted May 18, 1933.

Ark., Brinkley—City, O. V. McCreight, recdr., soon takes bids extending sewerage system, $41,000. P.W.A. project. Tentatively approved by Washington. K. W. Lefever, Gazette Bldg., Little Rock, engr. Noted Oct. 4.

Ark., Harrison—City, R. Worthington, mayor, soon takes bids sewerage system extensions, $125,000. P.W.A. project. F. A. Pritchett, Wallace Bldg., Little Rock, engr. Project tentatively approved at Washington. Noted July 19.

Ark., West Memphis — W. H. Hundhausen, mayor, soon takes bids sewers. Est. $62,000. P.W.A. project. T. H. Allen, McCall Bldg., Memphis, Tenn., engrs. Noted Oct. 25.

Ill., Dixon—City indefinitely postponed construction sewerage system because of public opposition. Enabling ordinance repealed after a referendum petition was filed making election necessary. Charles DeLeuw & Co., 20 North Wacker Dr., Chicago, engrs. Noted July 19.

Mo., St. Clair—City defeated $33,000 bonds, for constructing sewage disposal plant, equipment, auxiliary piping and sanitary sewers. W. A. Fuller Co., 126 Shenandoah Ave., St. Louis, engrs. Noted Oct. 4.

Tex., Artesian Gardens (Somerset P.O.)—City c/o Council, plans building sanitary sewerage system, incl. collecting mains and disposal plant, Artesian Gardens between Pleasanton and Somerset. This is newly incorporated town, mayor and town comrs. will be elected Oct. 27.

Tex., San Antonio—Bexar Co. Water Control & Impvt. Dist., c/o P. H. Mullinax, pres., 601 Pleasanton Rd., election Nov. 24, $117,000, sanitary sewers. Est. $154,000. P.W.A. project. H. R. F. Heland, 1020 Frost Bank Bldg., engr. Noted Aug. 30.

BIDS ASKED

Ala., Fairhope—Nov. 16, by Town Council, Town Hall, sewerage system and disposal plant, incl. 48,000 ft. 8 in. pipe, clarifier, digester, sludge bed, pumping station and outfall line. P.W.A. project. J. B. Converse & Co., Inc., State Office Bldg., Mobile, engrs.

D. C., Wash.—Nov. 13, by District Commissioner, District Bldg., 5 sewers.

Ia., Iowa City—Nov. 16, by City Council, sewage disposal plant, incl. trunk sewer line and sanitary and relief sewers, sanitary sewer interceptors, etc. $550,000. P.W.A. project. Currie Eng. Co., Webster City, engrs. City expects University of Iowa (State Bd. Educ.) to contribute 40 % of cost of project since 40 % of improvements lie in university section. Noted Aug. 9.

Mo., Monett—City, bids about Dec. 1, sewage disposal plant, equipment, auxiliary piping, $50,000. P.W.A. project. L. W. Adams, city engr. Burns & McDonnell Eng. Co., 107 West Linwood Ave., Kansas City, consult. engrs. Noted July 26.

N. Y., Jamestown—See "Contracts Awarded."

O., Ashtabuia—See "Contracts Awarded."

Wis., Mendota—Nov. 13, by State Bd. Control, Madison, constructing pressure sewer and pumping plant, 12,040 lin.ft. 10 in. c.i. and 50 ft. 15 vitr. tile pipe, reconstructing and revamping old aeration tank to provide pumping station and receiving well, 5 concrete manholes, 10 in. Venturi meter, 2 sewage pumping units with motors, controls, switches, electric equipment, lighting in pumping station. P.W.A. project.

CONTRACTS AWARDED

Conn., Hartford—Bd. Contr. & Supply, Contr. 7, Jefferson St. Tunnel, to James J. Coughlin & Sons Co., 80 Federal St., Boston, Mass., $394,891. Bids Oct. 2. Noted June 19.

Mass., Boston—Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, concrete sewer lines in Beaver Pl. to A. Baruffaldi, 52 Powder House Blvd., Somerville, $28,359. **P.W.A.** Bids Oct. 15. Noted Oct. 11.

Mass., Leominster—City, additions and extentions to sewerage disposal system. Work under way, under ERA. P.W.A. loan and grant of $250,000 originally approved but later rescinded. Metcalf & Eddy, 1300 Statler Bldg., Boston, engrs. Noted Aug. 2.

Mass., Natick—Town, Bd. P. Wks., Middlesex Ave., Contr. 3, furnishing, delivering gate valves, sluice gates and valve boxes, to Columbian Iron Wks., 2501 Chestnut St., Chattanooga, Tenn., $1,705. P.W.A. project. Bids Oct. 13. Noted Oct. 4.

Mass., North Adams—J. P. Miller, comr. P. Wks., sewerage system and pumping station in Blackington Dist., to Middlesex Constr. Co., Victory Bldg., Framingham, $35,765. **P.W.A.** Bids Oct. 23, awarded Oct. 31. Noted Oct. 11.

Mo., Bolivar—City, 52,633 ft. 8- to 12-in. vitr. tile pipe, 64 ft. 8 in. and 48 ft. 10 in. c.i. pipe, 955 Y branches, 131 manholes, 5 drop manholes, 13 flush tanks, 13 service connections, 1,600 ft. ¾ in. galvanized iron pipe, 5 cu.yd.

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miscellaneous concrete, disposal plant, to R. McSweeney, Springfield, $82,589 base bid. Est. $82,693. **P.W.A.** Bids Oct. 9. Noted Oct. 4.

N. J., Fanwood—Mayor and Boro Council, sewers, to L. Di Francesco, Westfield, $47,936. **P.W.A.** Bids Sept. 27.

New York—Westchester Co. Sanitary Sewer Comn., County Bldg., White Plains, constructing Sect. E-2 sewers, to A. J. Cianciulli, 922 Nepperham Ave., Yonkers, $188,438***Sect. E-3, to R. and T. Constr. Co., 23 Willow Pl., Brooklyn, $202,917***Sect. E-1, to Inter County Constr. Co., Rye, $125,975. Grand total $517,330. All awarded subject to P.W.A. approval.

N. Y., Jamestown—City, constructing **storm** sewerage in vicinity Fluvanna Ave., Washington and 22nd Sts., day labor. L. F. Graham, city engr. Noted Oct. 11.

N. Y., Malone—City, sewage works, Contr. 3 settling tanks, to Jeffrey Mfg. Co., Columbus O., $3,145. **P.W.A.** Noted Mar. 29.

O., Ashtabula — City, storm and sanitary sewers, street improvement, watermain extension and miscellaneous other projects, day labor under supervision of C. C. Downs, dir. Jefferson. Est. $120,579. **FERA** project.

O., Bowling Green—Director Service, Unit 3, sewage disposal plant, 1 m.g.p.d. capacity sludge digestion system, to Beaver & Morris, Inc., Blackstone Bldg., Cleveland, $114,308. **P.W.A.** Noted Aug. 9.

Pa., Franklin—City, constructing sewers, day labor, under supervision of J. McK. Snow, city engr. $11,002 funds allotted. RWD project. Est. $25,000.

Wis., Sun Prairie—City, air blower for sewage disposal plant, to Roots-Connersville-Wilbraham Division of International-Stacey Corp., Connersville, Ind., $491***sump pump, to Yeomans Bros. Co., 1433 Dayton St., Chicago, Ill., $165. **P.W.A.** Bids Oct. 12.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

N. Y., Hudson—Boston & Albany R.R. Co., G. A. Kirley, ch. engr., revised plans, specifications and estimate of cost for eliminating 3rd St. and Tanners Lane Crossings, have been approved by Pub. Service Com. $147,339. Noted Sept. 28.

Tex., Conroe—Montgomery Co., c/o R. H. Weatherly, judge, Conroe, election Nov. 17, $378,000, for bridges and road work. $492,000. W. F. Smith, Conroe, engr. P.W.A. project. Noted Aug. 2.

BIDS ASKED

Louisiana—Nov. 21, by State Hy. Comn., Baton Rouge, overpass and approaches 0.387 mi. Project 4808, U.S.P.W. Hy. Project NRH 169-D, between Livonia and Krotz Springs, Pointe Coupee Parish.

Maryland—Nov. 13, by State Roads Comn., Baltimore, extension to triple span concrete girder bridge over MacIntosh Run, on Loverville-Leonardtown Rd., Constr. SM-152-1-89, Federal Aid Project NRH 285-A, St. Marys Co.

New York—See "Streets and Roads."

N. Y., Olean—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, O., bids about Jan. 1, on revised plans eliminating grade crossing on Olean-Hinsdale Hy. $150,000.

Virginia—See "Streets and Roads."

CONTRACTS AWARDED

Alabama—State Hy. Dpt., Montgomery, concrete overhead crossing bridge, Opelika, Lee Co., to Barlow-Gordy Constr. Co., Garard Bldg., Columbus, Ga., $27,178; bridges on 3.725 mi. cottsboro-Larkinsville Rd., Jackson Co., to W. F. Scott, Thomasville, Ga., $15,998. **P.W.A.** Bids Oct. 19.

Iowa—State Hy. Comn., Ames, bridges, culverts in Cherokee Co., to Christensen Bros., Sioux City, $4,448***culverts in Fremont Co., to E. A. Wickham & Co., Council Bluffs, $3,556 ***Madison Co., to Schroyer & Stoops, Baxter and Ames, $10,596***Page Co., to W. E. Carlson, Essex, $5,237***Wayne Co., to W. E. Harness Constr. Co., Ottumwa, $6,461***Wayne Co., to G. Jordan & Son, Centerville, $9,452. Grand total $39,750. **P.W.A.** Bids Oct. 23. Noted Oct. 18.

Kentucky—State Hy. Comn., Frankfort, substructure for 4 steel span bridge over Levisa Fork at Nigh P. O., NRS 338 AB-1, Pike Co., to Codell Constr. Co., Winchester, $33,076. Bids Oct. 19. Noted Sept. 27 and Oct. 18.

Massachusetts—City of Boston, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, repairing, strengthening Chelsea North Bridge over Mystic River between Charlestown and Chelsea, to Coleman Constr. Corp., 245 State St., Boston, $243,820. Bids Oct. 10, awarded Oct. 30. Noted Sept. 28.

Montana—State Hy. Comn., Helena, bridges on Libby Manicke Rd., to Hansen Constr. Co., Opportunity, Wash., $17,530***on Dodson-Harlem Rd. and Ophiam South Rd., to L. V. Lockwood, Glasgow, $10,250 and $6,508 respectively***in Richland Co., to Prahl[illegible]telle, Miles City, $12,646***in Musselsh[illegible] Golden Valley Counties, to W. Mackin[illegible]way, $14,153. Grand total $61,087. [illegible] Bids Oct. 25. Noted Oct. 18, under [illegible] and Roads."

N. Y., Duanesburg—Delaware & Hud[illegible] Co., J. MacMartin, ch. engr., Albany, elim[illegible] Esperance Station Crossing, here, to W[illegible] English Constr. Co., 50 Church St., New [illegible] $46,556. Est. $55,183. Noted Sept. [illegible]

N. Y., Syracuse—New York Central R[illegible] J. W. Pfau, ch. engr., 466 Lexington Ave[illegible] York, signal materials for grade crossing [illegible] nations, to General Railway Signal Co[illegible] Park Ave., New York, Jobs (1) $74,21[illegible] $3,278 (3) $9,411. Grand total $86,906 [illegible] Jan. 11, under "Contracts Awarded."

North Carolina—State Hy. & P. Wks., R[illegible] bridge over Reddies River, Project 7783, [illegible] Co., to Hobbs-Peabody Constr. Co., 317 [illegible] Worthington Ave., Charlotte, $32,940. [illegible] Baise, acting engr.

Tennessee—Dpt. Hys. & P. Wks., Na[illegible] 0.347 mi. bridge and approaches over C[illegible] land River on State Hy. 25, at Carthage, NRH 262-B, NRM 262-C, Smith Co., to Vi[illegible] Bridge Co., Vincennes, Ind., $194,710. [illegible] Oct. 26. **P.W.A.** Noted Oct. 18, under [illegible] and Roads."

Texas—G. Gilchrist, state hy. engr., A[illegible] 6 span 171 ft. rein.con. bridge, Hy. 5, NRM 3C, Wichita Co., to C. S. Constant Co., [illegible] Box 783, Dallas, $22,113 est. $20,000*** constructing I. and G.N.R.R. underpass, Fort Worth, Hy. 34, NRM 385-J, Tarrant Co., Austin Bridge Co., 1815 Clarence St., Dallas, $37,042 est. $40,000. **P.W.A.** Bids Sept. 10. Noted Sept. 6.

STREETS AND ROADS

BIDS ASKED

Kansas—Nov. 17, by State Hy. Comn., at office of County Clerk, Troy, cover stone and sand gravel surfacing 110.21 mi. hys. in Osage, Nemaha, Marshall, Brown, Lyon, Wabaunsee, Riley, Pottawatomie, Johnson and Douglas Counties.

Kansas—Nov. 20, by State Hy. Comn. at office of County Clerk, Ellsworth, concrete paving, roadside improvement, earthwork, culverts, sand gravel paving 21,362 mi. hys. in McPherson, Ellsworth, Morris and Republic Counties.

Kentucky—Nov. 23, by State Hy. Comn., Frankfort, low type surfacing 1.9 mi. Hopkinsville-Clarksville Rd., S.P. 10½, Christian Co.; 3 mi. Marion-Providence Rd., S.P. 682, Crittenden Co.; 4.7 mi. Monticello-Whitley City Rd., state project, Wayne Co.; grading, drainage 6.7 mi. Jonesville-Williamstown Rd., state project, Grant Co.; 10 mi. Madisonville-Slaughters Rd., state project Hopkins Co.; 5 mi. Salem-Golconda Rd., state project, Livingston Co.; and 0.75 mi. Howardstown-Raywick Rd., state project Nelson Co.

Maine—See "Contracts Awarded."

Maryland—Nov. 13, by State Roads Comn., Baltimore, gravel paving 1.63 mi. Contr. AA-194-1-82, Federal Aid Project NRS 338-A, Anne Arundel Co.

New York—Nov. 20, by State Hy. Dpt., Albany, A. W. Brandt, comr., graveling 1.22 mi. Albany Co.; 2.63 mi. Franklin Co.; 3.74 mi. Jefferson Co.; 5.74 mi. Otsego Co.; 5.35 mi. Saratoga Co.; 3.49 mi. Schenectady Co.; 0.39 mi. Seneca and Wayne Counties; 3.45 mi. Wayne Co.; 4.16 mi. Wyoming Co.; shale surfacing 2.47 mi. Seneca Co.; concrete and macadam paving 1.26 mi. Tioga Co.; bridge in Albany Co.

Ohio—Nov. 16, by O. W. Merrell, dir. Hys., Columbus, concrete paving 1.095 mi. Sect. "H" Sedgwick Rd., North Ironton, Lawrence Co. $64,454.

Pennsylvania—Nov. 16, at office S. S. Lewis[illegible]secy. Hys., Harrisburg, bituminous surface course Spec. E on broken stone paving 15,014 ft. R-180, Sect. 3, Collingdale, Sharon, Hill, Folcroft, Glenolden and Norwood Boroughs; bituminous surface course Spec. E on broken stone paving and rein.-con. paving variable width street intersections, 16,541 ft. R-180, Sect. 4, Eddystone, Norwood, Prospect Park and Ridley Park Boroughs, Ridley Twp, both Delaware Co.; rein.-con. bridge, rein.-con. approaches 74 ft. R-268, Bridge No. 1, Franklin Twp., involving 1,378 cu.yd. Class 1 and 513 cu.yd. Class 2 excav.; bituminous surface course Spec. B on native stone paving 8,526 ft. R-983, Sect. 1, Bear Creek Twp., Luzerne Co., 14,524 cu.yd. Class 1, 305 cu.yd. Class 2 and 84 cu.yd. borrow excav.

Virginia—Nov. 15, by State Hy. Dpt., Richmond, surfacing 0.76 mi. Route 60, State Project NRH 24-FR1, Federal Project NRH 2, Unit 2, Alleghany Co.; curbing, guttering 0.4 mi. Route 311, NRM 747-A1, Fed. Project NRS-494-A, Roanoke Co.; macadam paving 1.5 mi. Route 8, State Project NRH 461-AR; Fed. Project 355-E, Roanoke Co.; 0.17 mi. Route 8, State NRH 461-AR, NRH 355-E, Giles Co.; 5.2 mi. Route 340, NRH 1022-AC, Fed. Project NRH 481-A, Augusta Co.; 45 ft. rein.-con. bridge, Route 11, NRM 361-B2; Fed. Project NRM 420-E, Smyth Co.; bridge on Route 8, State Project NRM 361-B1, Fed. Project NRM 372-F, in Martinsville.

†Federal Government

Streets and Roads (Continued)

Wisconsin—Nov. 20, by State Hy. Comn., Madison, concrete surfacing 3.809 mi. Quarry Overhead-Delafield Rd., S.T.H. 19 and 30, NRS 519-A, Waukesha Co., incl. 45.648 cu.yd. earth, borrow and channel excav., 4,688 cu.yd. loose rock excav.; grading, draining 18.1 mi. West County Line-Hayward Rd., State Trunk Hy. 27, State Project 8515, Sawyer and Washburn Counties, incl. 86,086 cu.yd. earth and borrow excav., ditches, 86,986 cu.yd. loose rock and 6,295 cu.yd. solid rock***1.902 mi. Alma-Mondovi Rd., Alma, State Trunk Hy. 37, Project 5459, Buffalo Co., 224,271 cu.yd. earth, borrow, marsh and channel excav. and constructing bridges on same road.

CONTRACTS AWARDED

Alabama—State Hy. Dpt., Montgomery, asphalt on concrete paving 0.871 mi. hy. in Tuscaloosa, Tuscaloosa Co., to Dunn Constr. Co., Lincoln Life Bldg., Birmingham, $32,707***grading, drainage 0.119 mi. in Guntersville, Marshall Co., to Ledbetter-Johnson, Rome, Ga., $5,722***seal coating 13.389 mi. Birmingham-Jasper Rd., Jefferson Co., to Carey-Reed Co., 3401 4th Ave. N., Birmingham, $20,242*** bituminous surfacing 2.839 mi. Fort Payne-Georgia Line Rd., De Kalb Co., to Hardaway Contg. Co., and Home Bldg., Columbus, Ga., $59,058***grading, drainage, chert surfacing 4.357 mi. Piedmont-Georgia line Rd., Cherokee Co., to Clark-Kearney & Stark, Philadelphia, Miss., $62,376***3.725 mi. Scottsboro-Larkinsville Rd., Jackson Co., to T. M. Strider & Co., Cotton States Bldg., Nashville, Tenn., $69,608. Grand total $249,713. **P.W.A.** Bids Oct. 19. Noted Oct. 11.

Arkansas — State Hy. Comn., Little Rock, grading, drainage structures, traffic service gravel surfacing 5¼ mi. Foran Gap-Boles Rd., Hy. 71, Sect. 11, Scott Co., and traffic service gravel surfacing 2.5 mi. Marianna-North Rd., Hy. 1, Sect. 10, Lee Co., to D. F. Jones Constr. Co., Pyramid Life Bldg., Little Rock, $65,275 and $4,792 respectively***grading, draining structures 7 mi. Aly-Onyx Rd. Hy. 27, Sect. 8, Yell Co., and 9 mi. Twist Ferry-Earle Rd., Cross and Crittenden Counties, to Halburt & Williams Co., Inc., and H. S. Sims, Delhi, La., $31,428 and $31,535 respectively. Grand total $133,210. Bids Oct. 24.

California—State Hy. Comn., Sacramento, grading 2.5 mi. hy. between Rock Creek and Storrie, Plumas Co., to Peninsula Paving Co., Standard Oil Bldg., San Francisco, $156,635. Bids Oct. 17, awarded Oct. 29. Noted Oct. 4.

California—State Hy. Comn., State Bldg., Los Angeles, grading, concrete paving 0.5 mi. hy. in city of Long Beach between Loma and Hathaway Aves., Los Angeles Co., to Sully-Miller Constr. Co., 1500 West 7th St., Long Beach, $54,294. Bids Oct. 18, awarded Oct. 29. Noted Oct. 4.

†**California**—Pub. Rds., San Francisco, grading 3.578 mi. road in San Luis Obispo Co., to Young & Son Co., Ltd., 599 Colusa Ave., Berkeley, $119,606. Est. $136,900. Bids Oct. 23, awarded Oct. 26.

Ill., Geneva—Dpt. P. Wks. & Buildings, Div. Hys., concrete paving 1.344 mi. Sect. 104-15d, Kane Co., to Illinois Hydraulic Stone & Constr. Co., Elgin, $44,820. Bids Oct. 24. Noted Oct. 18.

Iowa—State Hy. Comn., Ames, grading 3.007 mi. Cherokee Co., to Green Constr. Co., Des Moines, $18,761***3.212 mi. Fremont Co., to J. A. Carlson Constr. Co., Omaha, $11,919*** 4.118 mi. Madison Co., to V. L. Lundeen, Montezuma, $20,486***3.865 mi. Page Co., to F. I. Braden, Red Oak, $12,849***1.426 mi. Wayne Co., to Elarton & Elliott, Bussey, $8,558*** 5.957 mi. Wayne Co., to Sargent & Roth Constr. Co., New Virginia, $14,145***graveling 11.77 mi. Adair Co. and 7.205 mi. Fremont Co., to C. A. Emery, Coon Rapids, $22,762 and $12,199 respectively. Grand total $121,679. **P.W.A.** Bids Oct. 23. Noted Oct. 18.

Kentucky—State Hy. Comn., Frankfort, traffic bound limestone surfacing 4.352 mi. Cynthiana-Williamstown Rd., S.P. 162-CS, Harrison Co., to Ben W. Gorham Co., Lexington, $26,039, bids May 4; grading, draining 2.375 mi. Foxport-Mt. Carmel Rd., S.P. 43-DG, Fleming Co., to E. A. Chilton & Co., London, $13,024. Bids July 12. Noted June 28.

Kentucky—State Hy. Comn., Frankfort, grading, draining 5.322 mi. Drakesboro-Paradise Rd., S.P. 407 A-G, and 8.322 mi. Central City-Earles Rd., S.P. 127 A-G, to Frazer & Cocke, Paducah, $19,580 and $32,330 respectively***11.892 mi. Greenville-Elkton Rd., S.P. 79 A-G, to C. Myers, Campbellsburg, Ind., $52,000***5.548 mi. Graham-Earles Rd., S.P. 406 A-G, to J. F. Mulligan, Greenville, $33,000, all foregoing in Muhlenberg Co.***6.44 mi. Pikeville-Virginia State line, S.P. 64 B-G, to Codell Constr. Co., Winchester, $128,013. Grand total $264,923. Bids Oct. 23. Noted Oct. 4.

Kentucky—State Hy. Comn., Frankfort, to G. L. Brantley, Winchester, grading, draining 3.759 mi. Glasgow-Flippin Rd., NRS 331 AG, Barren Co., $33,267***to E. L. Beyer Coal & Wrecking Co., Paducah, grading, draining 3.644 mi. Jordan-Cayce Rd., NRS 329 AG, Fulton Co., $13,060***to S. H. Hart Constr. Co., Lexington, 4.4 mi. Ulvah-Blackey Rd., FR 36-EG, Letcher Co., $60,786***to J. Oman, Jr., Acklen Park, Nashville, Tenn., 1.974 mi. Central City-Madisonville Rd., NS 330 AG, Muhlenberg Co., $29,075 ***to N. E. Stone & Co., Madisonville, bank gravel surfacing 3.89 mi. Fulton-Dukedom Rd., Fulton, Hickman and Graves Counties, $11,957; traffic bound river gravel surfacing 6.022 mi. Columbus-Hailwell Rd., FR 97 AS, Hickman Co., $20,286; rein.-con. paving 0.464 mi. Fountain Ave., Paducah, NRM 154 FS, McCracken Co., $28,642***to Ben W. Gorham Co., Lexington, bituminous surfacing type 2 on waterbound macadam paving 2.702 mi. Madisonville-Sacramento Rd., NRH 183 BS, McLean Co., $24,349 ***to L. E. Marks, Bardstown, traffic bound limestone surfacing 3.1 mi. Bardstown-Shepherdsville Rd., S.P. 275 AS, Nelson Co., $10,852 ***to Carey-Reed Co., Lexington, surfacing and repairs on 0.636 mi. street in Morehead, NRM 67 BS, Rowan Co., $27,166***to Ky.-Va. Stone Co., Middlesboro, beautification of Cumberland Falls-Corbin Rd., NRH 224 A-G-1, Whitley Co., $7,400***to E. L. Traughber, Elkton, rock asphalt surfacing 2.964 mi. Eddyville-Princeton Rd., NRH 162 AS, Lyon Co., $47,176***to H. L. Johnson & Co., Lewisport, traffic bound limestone surfacing 6.024 mi. Smithland-Bayou Rd., FR 42 AS, Livingston Co., $18,169***to R. M. Robinson, Owensboro, traffic bound slag surfacing 4 mi. Louisa-Sandy Hook Rd., NRS 336 AS, Lawrence Co., $23,101***to Corum Bros., Madisonville, bituminous surfacing type 2 on waterbound macadam base 3.806 mi. Madisonville-Sacramento Rd., NRH 183 AS, Hopkins Co., $35,317; traffic bound limestone surfacing 8.6 mi. Slaughters-Rumsey Rd., S.P. 101 BS, Hopkins Co., $20,870***to Codell Constr. Co., Winchester, rein.-con. and rock asphalt paving 1.109 mi. Pike St., Covington, NRM 141 AS, Kenton Co., $60,000. Grand total $471,476. Bids Oct. 19. Noted Sept. 27 and Oct. 18.

Louisiana—State Hy. Comn., Baton Rouge, grading, drainage structures 10.256 mi. Project 3301-A, White Castle-Donaldsonville Rd., Iberville and Ascension Parishes, to J. J. McKeithen, Grayson, $58,474. **P.W.A.** Bids Oct. 16. Noted Oct. 25.

Maine—State Hy. Comn., Augusta, gravel surfacing 0.25 mi. NRH 258-A, Grafton, force account. **P.W.A.**

Maryland — State Roads Comn., Baltimore, grading, drainage for dual hy. 4.19 mi. Contr. B-316-48, Federal Aid Project NRH 235-A, Baltimore Co., to C. J. Langenfelder & Son, Roseldale, $147,635. **P.W.A.** Bids Oct. 9. Noted Oct. 4.

Mass., Somerville—City Engineering Dpt. at office J. E. Mullaney, city engr., City Hall, sheet asphalt on concrete paving, resetting granite curbs Project 8685-E, Powder House Blvd. and Project 8685-D, Central St., to C. J. Maney Co., 50 Congress St., Boston, $20,078 and $30,968 respectively. **P.W.A.** Bids Oct. 15. Noted Oct. 11.

Michigan—State Hy. Dpt., Lansing, grading, shaping, constructing drainage structures, concrete paving 0.509 mi. NRH 34-37C-2 and NRM 34-37C-3, Ionia Co., to E. J. Vander Veen, Grand Rapids, $30,489; grading, shaping road, drainage and concrete paving 0.646 mi. NRM 44-19C-6, Lapeer Co., to Bridgeport Core & Sand Co., Saginaw, $22,876. **P.W.A.** Bids Oct. 19.

Miss., Greenville—Bd. Supervs., Washington Co. Hy. Comn., grading, drainage structures, bridge and gravel surfacing 8.593 mi. Hollandale-Yerger Hy., and 11.548 mi. Murphy-Slaters Ferry Hy., to Barber Bros., Baton Rouge, La., $58,700 and $65,597 respectively, est. $52,000 and $62,000 respectively***grading, drainage structures, gravel course paving 5.593 mi. Winterville-Priscilla Hy., to B. G. Coggins, Nettleton, $24,673 est. $26,000. Grand total $148,970. **P.W.A.** Bids Sept. 27.

Missouri—State Hy. Bd., Jefferson City, to W. J. Menefee Constr. Co., Sedalia, graveling 4.018 mi. Wentzville-New Melle Rd., Sect. 1A, $3,364; 3.85 mi. Sect. 2A, same road, $5,796, both St. Charles Co.***to Toma Quarries, Inc., 220 West 39th St., Kansas City, 3 mi. Tray-Hawk Point Rd., Sect. M1A, $950; 10 mi. Sect. M1B, same road, $792, both Lincoln Co.*** to J. L. Pohl, Nevada, 4.974 mi. Sect. 1A, Goshen Rd. N., $2,243; 11.7 mi. Princeton Rd. W., Sect. M1, $5,019; 13.1 mi. Sect. M2, same road, $7,608, all foregoing Mercer Co.; 5.5 mi. Grundy Co., $2,632; 3.4 mi. Chillicothe Rd. Northwest, Sect. M11, $729; 0.5 mi. Sect. M11, Route 36-Wheeling Rd., $270, both Livingston Co.***to Lay Constr. Co., North Kansas City, 21.9 mi. Chariton Co., $8,457; 9.5 mi. Shelby Co., $1,013; 13.5 mi. Audrain and Boone Counties, $2,023; 1.1 mi. Boone Co., $274; 9 mi. Randolph Co., $4,604; 4.2 mi. Scotland County-Baring Rd., Sect. M1, $745; 1.1 mi. Newpark-LaBelle Rd., Sect. M12, Knox Co., $260; 0.343 mi. Laclede Co., $37; 0.343 mi. Sect. 18B, same road, $79; 5.2 mi. Brookfield Brunswick Rd., Sect. M2, $429; 5 mi. Purdin Rd. E., $292, all foregoing Linn Co.; 2.5 mi. Laddonia Rd. E., $247; 11.5 mi. Boone-Mexico Rd., $1,723; 3.3 mi. Route 54-Thru Farber Rd., $247, all foregoing Audrain Co.; 1.4 mi. Memphis-Lewis Co. Rd., Sect. M1, $190; 12.3 mi. Memphis-Lewis Co. Rd., Sect. M2, $2,035; 0.7 mi. Arbela Spur, Sect. M3, $69; 1.3 mi. Granger Spur, Sect. M4, $132; 6.7 mi. Route 4-Gorin Rd., Sect. M11, $200; 11.3 mi. Memphis-Knox Rd., Sect. M2, $2,505, all foregoing Scotland Co.; 16.4 mi. Lewistown-Canton Rd., Sect. M1, $1,276; 11.1 mi. St. Patrick-Route 96 Rd., Sect. M11, $774; 8.6 mi. Newark-LaBelle Rd., Sect. M11, $1,199; 2 mi. Sect. M11, same road, $413, all foregoing Lewis Co.; 4.1 mi. Route 61-Gregory Landing Rd., Sect. M11, $117; 5.1 mi. Route

†*Federal Government.*

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Streets and Roads (Continued)

4-Wyaconda Rd., Sect. M11, $253; 3.3 mi. Scotland Co., Sect. M1A, $536; 8.6 mi. Sect. M1B, same road, $1,036; 3.9 mi. St. Patrick-Route 61 Rd., Sect. M11, $335; 2.1 mi. Sect. M12, same road, $330***to Neyer Constr. Co., Billings, 4.886 mi. Stober-Route 5 Rd., Morgan Co., $9,993; 4.901 mi. Salem North Rd., Sect. 499B, $3,770; 4.734 mi. Sect. 499A, same road, $3,644, both Dent Co.***to L. Gray, 0.583 mi. Caledonia-Bismarck Rd., Sect. 497D, $3,407; 0.486 mi. Sect. 497E, same road, $1,870, both St. Francois Co.; 0.074 mi. Sect. 497A, same road, $666; 4.447 mi. Sect. 499D, same road, $49,308; 3.065 mi. Sect. 497C, same road, $24,553; bridge on same road, all foregoing Washington Co.***to D. Pray, Monett, 4.538 mi. Winona-Alton Rd., Sect. 512A, $3,383; 3.844 mi. Sect. 512B, same road, $2,472***to C. I. Williams, Monett, 4.088 mi. Sect. 1, Rich Hill-St. Claire Rd., $4,802; 4.056 mi. Sect. 2, same road, $12,981; and bridge same road, all foregoing Bates Co.***to E. L. Niehous, Lamar, Route 71- Golden City Rd., Sect. 492A, $3,156; 3.409 mi. Sect. 492B, same road, $3,359; 3.801 mi. Sect. 492C, $4,326, all foregoing Barton Co.***to Ray & Son, Louisiana, 4 mi. Louisiana-Eolia Rd., Sect. M11A, $1,205; 4.1 mi. Sect. M11B, same road, $1,905, both Pike Co.***to Stewart Sand & Material Co., City Bank Bldg., Kansas City, 6.7 mi. Norborne Rd., $2,742; 0.9 mi. Carrollton Spur, $626; 0.6 mi. Carrollton West Rd., $394, all foregoing Carroll Co.***to C. H. Atkinson, Chillicothe, 4.245 mi. Nodaway Co., $8,690; 1.6 mi. Route 46-Isadora Rd., $442; 6.5 mi. Grant City-Allendale Rd., Sect. M3, $2,016; 6 mi. Grant City-Iowa Line Rd., Sect. M1, $1,901; 9.3 mi. Grant City-Gentry Rd., Sect. M2, $3,881; 12.6 mi. Sheridan-Grant City Rd., Sect. M2, $4,849, all foregoing Worth Co.; 1.6 mi. Route 6-Amity Rd., Sect. M11, $494; 8.6 mi. Maysville Rd. W., Sect. M2, $5,389, both DeKalb Co.; 4.6 mi. Stanberry Rd. W., $1,507; 10.4 mi. Harrison County Rd. W., $7,007; 4.6 mi. King City-Andrew Co. Rd., $1,632; 3.4 mi. Albany-Evona Rd., Sect. M1, $1,731; 6.9 mi. Evona Rd. S., Sect. M11, $494; 10.4 mi. Route 4-Worth Co., $7,203, all foregoing Gentry Co.***to Henderson Constr. Co., Richmond, 0.7 mi. Route N-Cowgill Rd., Sect. M11, $297; 7.2 mi. Route 13-Braymer Rd., Sect. M11, $3,056; 3.9 mi. Route 36-Route 69 Rd., $1,796, all foregoing Caldwell Co.; crushed stone or graveling 0.6 mi. Jet Routes 6 and 13, $486; 7.1 mi. Route 36-Route 69 Rd., Sect. M11, $3,650***to Samples & Elsea, Kirksville, 9.7 mi. Livonia-Lancaster Rd., Sect. M1, $3,180; 1 mi. Lancaster Rd., South M2, $123, both Schuyler Co.; 6.8 mi. Hartford Rd., Sect. M11, $1,122; 4 mi. Sect. M12, same road, $3,520, all foregoing Putnam Co.; 8 mi. Milan Rd. N., Sect. M1, $462; 5.9 mi. Sect. M2, same road, $389; 1.8 mi. Green City-Green Castle Rd., Sect. M4, $119, all foregoing Sullivan Co.; 2.827 mi. Herman-Route M Rd., Sect. 419A1, $5,467; 3.189 mi. Sect. 419B1, same road, $2,075, both Gasconade Co.; 9.1 mi. Greencastle-Kirksville Rd., Sect. M1, $601; 4.5 mi. Novinger Rd. N., Sect. M12, $3,366; 6.5 mi. Greencastle-Kirksville Rd., Sect. M3, $715, all foregoing Adair Co.*** to F. T. O'Dell Constr. Co., Hannibal, 1.637 mi. Route 100-TR to Berger Rd., Sect. 1, Franklin Co., $5,295; 4.702 mi. Hallsville-Centralia Rd., Sect. 439I, Boone Co., $7,546***to J. A. Visintine, Kansas City, 5 mi. Route 71-Fillmore Rd., Andrew Co., $2,525; 5.9 mi. Holt Co., $1,699; 8.9 mi. Nodaway Co., $4,574; 8.2 mi. Cass Co., $2,048; 5.9 mi. Johnson Co., $2,946; 6.4 mi. Clay Co., $4,541; 5.3 mi. Lafayette Co., $3,297; 3.038 mi. Route D-Santa Rosa Rd., Sect. 490C, $4,362; 2.651 mi. same road, Sect. 490B, $3,786; 2.481 mi. Sect. 490A, same road, $3,552, all foregoing DeKalb Co.; 5.7 mi. Lathrop-Tourney Rd., Sect. M11, $2,224; 0.1 mi. road in Lathrop, Sect. M1, $355, both Clinton Co.; 1.7 mi. Route 71-Dearborn Rd., Sect. M11, $804; 8.1 mi. Sect. M12, same road, $3,642, both Platte Co.***to E. T. Markham, Cape Girardeau, 3.017 mi. Cape Girardeau-Dutchmantown Rd., Sect. 1B, $22,959 2.24 mi. Sect. 2B, same road, $16,665; 3.977 mi. Jasper-Route B Rd., Sect. 3A, $2,275; 3.731 mi. Sect. 394E1, same road, $2,119; 2.725 mi. Sect. 294D1, $1,554, all foregoing Jasper Co.***to O. H. Schmidt, Inc., St. Joseph, 1.981 mi. Clinton Co., $3,516; 2.822 mi. Route 4-Martinsville Rd., Sect. 1, $7,171; 3.068 mi. Sect. 2, same road, $7,745; 3.8 mi. Route 69-Ridgeway Rd., Sect. M11, $1,780, all foregoing Harrison Co.; 3.388 mi. Route 71-Route 169 Rd., Sect. 384A1, $6,280; 4.583 mi. Route 71-Route 169 Rd., $8,074; 4.409 mi. Sect. 384C1, same road, $7,503, all foregoing Buchanan Co. Grand total $418,293. Bids Oct. 12. Noted Oct. 4.

Montana—State Hy. Comn., Helena, grading, surfacing and 2 treated timber bridges in Carbon Co., to C. Shannon and Woodward Johnson, both Butte, $120,354***grading, surfacing roads in Lincoln Co., to J. C. O'Connor, Butte, $79,772***regrading, resurfacing, drains on 13.861 mi. Dodson-Harlem Rd., to Inland Constr. Co., 3807 Leavenworth St., Omaha, Neb., $97,296***grading, surfacing, drain on 8.473 mi. Golden Valley and Musselshell Counties, to Collison & Dolvin, Inc., Billings, $83,611***2.945 mi. Beaverhead Co., to B. Curtiss Constr. Co., Minneapolis, Minn., $64,530***1.812 mi. Onhiam South Rd., to C. Braechen, Valier, $28,864***road and bridges in Valley Co., to Massman Constr. Co., Glasgow, $64,973***grading, surfacing, drain on 10.617 mi. Richland Co., to A. LaLonde, Sidney, $101,112***widening gravel surface and road mix oil treating road in Gallatin Co., to S. Birch & Sons Co., Great Falls, $20,747***25.947 mi. road in McCone and Dawson Counties, to C. Shannon, Butte, $ Grand total $727,760. **P.W.A.** Bids Noted Oct. 18.

New Hampshire—State Hy. Dpt., gravel surfacing 1.416 mi. Central Rd. wood, Rockingham Co., to Arborio Road Co., Inc., Wilson, Conn., $47,547 est. 1.024 mi. Westmoreland-Chesterfield Rd hire Co., to Lockwood-Young Corp., St., Concord, $15,898 est. $17,000. 25. Noted Oct. 18.

New Jersey—State Hy. Dpt., Trento structing 3.001 mi. Route S-49, Sect. B, from Green Creek to Dias Creek R storm drain at South Dennis, Cape M incl. 14,542 cu.yd. excav., to E. H. Ell ville, $115,484. Noted Oct. 11.

N. Y., Port Chester—Village, improvin chester Ave. and North Regent St., to & Murray Contg. Co., 144 Saw Mill Riv Yonkers, $83,830. **P.W.A.** Bids Aug. 13. Aug. 9.

North Carolina—State Hy. and P. Raleigh, to Roberts Paving Co., Salisbury concrete paving 5.34 mi. Hy. Route 12, 1494, $114,285, and 0.97 mi. same hy., 1500, $21,921, both Hertford Co.***to Constr. Co., Florence, S. C., grading, s phalt surfacing 7.22 mi. Route 41, 2224, Sampson and Duplin Counties, $81 to Cobb & Homewood, Chapel Hill, str on same road, $5,495***to W. F. Bow 540 Reynolds St., Augusta, Ga., concrete 2.96 mi. Route 20, Project 6555, Mec and Union Counties, $64,728***to G. R. Salisbury, 0.49 mi. Route 10, Project Rowan Co., $5,888***to Gassoway & Winston-Salem, bituminous surface treatin mi. Route 16, Project 7183, Watauga and well Counties, $9,034 and 0.84 mi. Rou Project 7701, Watauga Co., $4,669***to Grannis, Fayetteville, concrete paving and approaches over Reddies Creek, Rou Project 7783, $19,045; concrete paving proaches to bridge over Yadkin River, R 60, Project 7784, $893, both Wilkes Co.*** to R. B. Tyler Co., 1446 Levering St., Louis Ky., bituminous surfacing 3.07 mi. Route Buncombe Co., $11,135. Grand total $338,

O., Ashtabula—See "Sewerage and Waste Disposal."

O., Cincinnati—City Manager, curbs and gutters on Vielay St., to J. E. Roach, Jr., Huron Ave., $22,310. **P.W.A.**

Tennessee—Dpt. Hys. & P. Wks., Nashville, grading, drainage, paving 0.58 mi. Davidson Co., to Municipal Paving & Constr. Co., Cotton States Bldg., Nashville, $43,306***grading, drainage, constructing 2 bridge 0.83 mi. Henry Co., to J. Oman, Jr., Acklen Park, Nashville, $24,066***grading, drainage 1.306 mi. Perry Co., to Marion Constr. Co., 419 12th Ave. S., Nashville, $37,621***2.726 mi. Bedford Co., to Lebanon Bridge Co., c/o Sam Davis Hotel, Nashville, $25,241***paving 5.473 mi. Lake Co., to Zigler Constr. Co., 803 Amer. Trust Bldg., Nashville, $84,105. Grand total $214,369. **P.W.A.** Bids Oct. 26. Noted Oct. 18.

Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures, concrete paving 2.994 mi. State Hy. 5, NRH 3B, and NRM 3-C, Wichita Co., to Combs & Glade, Wichita Falls, $164,312 est. $200,000 grading, drainage structures, underpass, concrete and bituminous filled brick paving 1.401 mi. State Hy. 34 NRM 385-J, Tarrant Co., to Brown & Root, Inc., Colorado St., Austin, $157,379 est. $200,000. **P.W.A.** Bids Sept. 10. Noted Sept. 6.

Virginia—State Hy. Dpt., Richmond, improving 0.169 mi. Shenandoah Co., to Clark & Lewis, Luray, $37,916***0.45 mi. Spotsylvania Co., to S. E. Finley, Roanoke, $26,126***0.19 mi. and 0.26 mi. Loudoun Co., to Blackwell Eng. & Constr. Co., Warrenton, and Alley Constr. Co., Bristol, $22,021***Augusta Co., to R. W. Moore & Co., Staunton, $9,005***bridge and overhead structure in Dinwiddie Co., to R. K. Williams, Inc., Belt Line and Cary St., Richmond, $11,763 and $18,125 respectively. Grand total $124,956. **P.W.A.** Bids Oct. 16 and 23. Noted Oct. 4 and 11.

Washington—L. V. Murrow, dir. Hys., Olympia, concrete paving 0.59 mi. road in Yakima Co., to Midstate Contract Co., 513 1st Ave. S., Yakima, $27,490; 1.735 mi. Chelan Co., to C. A. Power, East 27-8th Ave., Spokane, $54,678. **P.W.A.** Bids Oct. 23. Noted Oct. 11.

Wisconsin—State Hy. Comn., Madison, concrete paving 3.504 mi. road in Ashland Co., to V. Nelson, 2201 Hughitt Ave., Superior, $90,030. **P.W.A.** Bids Oct. 16. Noted Oct. 4.

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EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., San Mateo—San Mateo Co. Harbor Dist., port development. P.W.A. loan and grant of $403,000 rescinded due to failure of voters of district to vote bond issue to finance work in part.

†**Tex., Brownsville**—U. S. Eng. Army Post soon takes bids drainage system $25,000, sheet $15,000, road improvements $54,000.

BIDS ASKED

Calif., La Mesa—Nov. 17, by La Mesa Spring Valley & Lemon Grove Irrigation Dist., C. Harritt, ch. engr., constructing concrete and steel

†*Federal Government*

Earthwork, etc. (Continued)

pipe line, to by-pass water in old flume around new pipeline; 4,500 lin.ft. 24 in. welded steel pipe, 22 Dresser couplings, 1,000 lugs, 20,616 ft. lay and remove 24 in. welded steel pipe, 1,673 lin.ft. concrete slab in tunnels, removing old wooden flume 41,000 lin.ft.; to connect services to new line, incl. sixteen 3 in., fifty-four 4 in. companion flanges, seventy 2 in. gate valves, seventeen 2 in. disc meters, (Neptune Trident or equal), three 1 in. of same; seventy 2 in. Dresser couplings, 1,750 lin.ft. 2 in. galv. screw pipe; fittings, constructing branch line, involving 2,265 lin.ft. 8 in. welded steel pipe, 695 ft. 6 in. welded steel pipe, pipe line in tunnel; 327 lin.ft. 42 in. centrifugal concrete pipe; 41 cu.yd. "B" concrete; 9 blow-off wells; concrete spillway, 1,635 lin.ft. 24 in. centrifugal concrete pipe, 3 spillway basins, 1,043 cu.yd. excav., 1,043 cu.yd. backfill, concrete pipe line, 400 lin.ft. 42 in. centrifugal concrete pipe (No. 2 grade); 204 cu.yd. excav., 408 cu.yd. backfill. To exceed $17,740. P.W.A. loan and grant for project of which this is part, amounted to $600,000.

Calif., Newport Beach—Nov. 19, by City Council, constructing bulkhead at entrance to channel in harbor at Newport Beach, structure 575 ft. long constructed of 4 in. x 12 in. x 26 ft. T and G creosoted timber sheathing with anchor piles. 1911 Act, Sect. A, 323 lin.ft., Sect. B, 252 lin.ft., involving 65,000 bd.ft. 4x12 T and G, 5,400 ft. 6x8 and 1,100 bd. ft. 6x12 T and G creosoted sheet piling. $18,000. R. L. Patterson, City Hall, engr.

†Ia., Muscatine—Nov. 27, by U. S. Eng., Rock Island, Ill., constructing Dam 16 on Mississippi River, incl. movable gate section, spillway section, and earth dikes, 1,500 ft. entrance roadway will connect end of dam with U. S. Hy. 61, 1,151 ft. cofferdam, 75,000 cu.yd. common, 775,000 cu.yd. dredged and 200 cu.yd. rock excav., 800 sq.ft. channeling, 20,500 cu.yd. fill, 29,000 cu.yd. dike embankment, 178,000 lin.ft. timber piling, 3,800 ft. concrete piling, 168,500 sq.ft. steel sheet piling, 38,000 ft. yellow pine timber creosoted, 19,000 ft. oak timber, 13,920 cu.yd. derrick stone, 14,100 cu.yd. rip rap stone, 2,300 cu.yd. gravel, 59,000 cu.yd. "B" and 1,050 cu.yd. "A" concrete, 1,375,000 lb. structural steel in service bridge, 1,330,000 lb. structural steel tainter gate, 1,005,000 lb. structural steel in roller gate, 1,135,000 lb. miscellaneous structural steel, 2,560,000 lb. reinforcing steel, 125,000 lb. steel forgings, 235,500 lb. steel castings, 3,050 lb. iron castings, 7,800 lin.ft. fiber conduit, 3,460 lin.ft. metal conduit, 1,920 lin.ft. handrailing, 1,300 track ft. crane track, 4 roller gate, and 15 tainter gate operating machines, 1 flat car, drilling, grouting, electrical, grounding system, floor grating, etc. Noted Oct. 4.

†Mo., Canton—Nov. 27, by U. S. Eng., Federal Bldg., Rock Island, Ill., furnishing, delivering, installing traveling tainter gate hoist for Dam 20 on Mississippi River, near here.

Neb., Paxton — Nov. 14, by Platte Valley Power & Irrigation Dist., North Platte, 2,200,000 cu.yd. earth excav., 5,000 cu.yd. concrete canal lining, 100 tons wire mesh reinforced steel; relocation 2 mi. road. Parsons, Klapp, Brinkerhoff & Douglas, 142 Maiden Lane, New York, consult. engrs.

†Ore., Ontario—Nov. 26, by Bureau Reclamation, Ontario, Ore., constructing Malheur River and Dead Ox Siphons, North Canal, Dead Ox Flat Division, Owyhee Project, Oregon-Idaho, 6 mi. southwest of here. Spec. 598.

CONTRACTS AWARDED

†California—U. S. Eng., Sacramento, 82,000 cu.yd. levee work to strengthen existing levee on Sacramento River, near Colusa, to Poulas & McEwen and D. McDonald, Sacramento, $22,000***furnishing, placing 7,800 tons rip rap stone along banks Sacramento River, to Basalt Rock Co., Inc., Napa, $18,720***112,000 cu.yd. levee work to raise existing levees along Feather and Yuba Rivers, near Marysville, to Harms Bros., Sacramento, $16,240. Grand total $57,860. Bids Oct. 10 and 11.

Calif., Los Angeles—Flood Control Dist., 205 South Bway., flood control works in and below Dunsmuir, Pickens, Hall-Beckley and Hay Canyons, Bd. Supervs. appropriated $250,000 for purchase of supplies and rental of equipment for construction, Labor to be supplied by S.E.R.A. Est. $250,000. S. M. Fisher, 205 South Bway., engr.

Calif., Modesto—C. S. Abbott, secy. Modesto Irrigation Dist., constructing rock cut, repair old lining by guniting, constructing rein.-con. structures all in main canal of district, involving 251,700 sq.ft. 1½ in. and 237,000 sq.ft. 2 in. gunite, to California Gunite Co., Hollywood, $36,525***170 cu.yd. rein.-con., 201,485 sq.ft. 2½ in. and 155,000 sq.ft. 3 in. concrete lining, to J. N. Kristich, Knightsen, $31,263. Bids Oct. 16. Noted Oct. 4.

†Massachusetts—U. S. Eng., Boston, dredging 1,424,000 cu.yd. from Cape Cod Canal, to Great Lakes Dredging & Dock Co., 17 Battery Pl., New York, N. Y., $496,970. Bids Oct. 17. Noted Oct. 4.

Mass., New Bedford — City, City Engineer, Municipal Bldg., bulkhead at Popes Island, to F. C. Taylor, Fairhaven, $14,800. **P.W.A.** Bids Oct. 4, awarded Oct. 31. Noted Oct. 9 Daily.

†N. Y., Ogdensburg—U. S. Eng., Buffalo, dredging 160,000 cu.yd. in Ogdensburg Harbor, to R. C. Huffman Constr. Co., Buffalo, $41,440. Bids Oct. 16. Noted Oct. 15 Daily.

†Tenn., Nashville—U. S. Eng., Custom House, surmounting Dam 2, Cumberland River, near here, to Lakes States Eng. Co., 111 West Jackson St., Chicago, Ill., $58,477. Bids Oct. 16. Noted Oct. 11.

†Tex., Brazos Island—U. S. Eng., Galveston, dredging 17,490,000 cu.yd. from Brazos Island Harbor, to Atlantic Gulf & Pacific Dredging Co., 13 Park Row, New York, $1,371,897. Bid-Aug. 1.

UNCLASSIFIED

PROPOSED WORK

N. J., Asbury Park—SURF GARDEN, etc.—Municipality, L. P. Croce, Asbury Park, plans surf garden, park, bathhouse, pool, playground, etc., Beach from Casino Building to Ideal Lake Dr., $1,000,000. **Maturity indefinite.** I. S. Chanin, 122 East 42nd St., New York, archt.

†Tex., Brownsville—SHED—See "Earthwork, Irrigation, Drainage, Waterways."

BIDS ASKED

†Mass., Chelsea—WHARF and PIER—Nov. 13, by Superintendent Lighthouses, 2nd Dist., 37 Marginal St., repairing and timber wharf and pier additions at Lighthouse Depot.

N. Y., New York—SPECIAL WORK—Nov. 20, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., special work (rails, frogs and switches) for use in Rapid Transit Railroads, Order 63.

N. Y., Orangetown—GAS LINES and DISTRIBUTION SYSTEM—See "Contracts Awarded."

Pa., Clarion—RADIO BROADCASTING STATION—See "Contracts Awarded."

Tenn., South Pittsburgh—FERRY—J. Hogan, engr., Jasper, taking bids erecting cable ferry across Tennessee River, near here, concrete wharfs and founds., for Marion Co. $30,000.

†T. H., Honolulu—WHARF, etc.—Dec. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., wharf, shed, disinfecting building.

CONTRACTS AWARDED

Calif., Woodlawn — MAUSOLEUM — W. G. Merchant and Maybeck & White, assoc. archts., Russ Bldg., San Francisco, rein.-con., marble and bronze interior, concrete, granite (chapel portion), mausoleum, Woodlawn Cemetery, for Woodlawn Cemetery Assn., Woodlawn, to H. H. Larsen, 64 South Park, San Francisco, $184,821. Awarded Oct. 27. Noted Oct. 4.

Conn., Weston — LAND DEVELOPMENT — John A. Anderson, 58 East State St., Westport, developing 300 acres for exclusive residential purposes to include artificial lake, polo field, artesian wells and roads. Gravel roads, to Clifford Bros., Weston***drilling artesian well, to R. A. Welson, Weston***and artificial lake, to W. Anderson, Westport. To exceed $100,000. C. Tate, Westport, and Dr. J. B. Watson, New York, purchased property.

Ind., Indianapolis—BROADCASTING STATION—State Dpt. P. Safety, A. Feeney, chn., Indianapolis, steel, brick broadcasting station, for police at State Fair Grounds, to J. H. Crawley, Fairgrounds. Est. $35,000.

New Jersey — BORINGS — State Hy. Comm., Trenton, borings for crossing of Raritan River at Perth Amboy, Middlesex Co., to Battle Bros., Scranton, Pa., $5,530. Bids Oct. 29. Noted Oct. 25.

N. J., Sayreville—WATER STORAGE TANKS—Titanium Pigment Co., 111 Bway., New York, 6 steel water storage tanks, to Treadwell Constr. Co., Easton, Pa. Est. exceeds $8,500. **P.W.A.**

N. Y., Aurora and East Aurora—SHELTER—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., 466 Lexington Ave., New York, shelters and elevators enclosures at various crossings, to Ferguson & Edmondson, Aurora. To exceed $17,000.

N. Y., Brooklyn — COAL POCKET — Long Island R.R. Station, A. C. Watson, ch. engr., Pennsylvania Sta., New York, 1 story coal pocket, concrete, Junius St. and Balke Ave., to Nicholson Co., 405 Lexington Ave., New York. Est. $30,000. Noted Nov. 1.

N. Y., New York—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, 1 story, 165x330 ft. swimming pool, day labor. To exceed $35,000. A. Embury, c/o owner, archt.

N. Y., Orangetown—GAS LINES and DISTRIBUTION SYSTEM—Ramapo Gas Corp., Orangetown, extending facilities, separate contracts and day labor. To exceed $18,000.

N. C., Fayetteville—DOCK, etc.—S. W. Tomlinson, city clk., constructing dock and wharf, to R. J. Reid Constr. Co., P. O. Box 1990, Birmingham, Ala., $79,500. Formerly awarded to J. W. Bowers, Whiteville, $68,819, but he withdrew his proposal. **P.W.A.**

Pa., Clarion—RADIO BROADCASTING STATION—Clarion Broadcasting Co., Inc., J. V. Ketley, pres., radio broadcasting station, incl. equipment of 250 watts for broadcasting on 850 k.c. wavelength, separate contracts. Est. $30,000. Private plans. Noted Sept. 27.

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†Federal Government.

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MATERIALS AND EQUIPMENT

BIDS ASKED

CEMENT—**Los Angeles, Calif.**—Nov. 27, by Bd. Directors Metropolitan Water Dist., 306 West 3rd St., S. A. Joseph, purch. agt., 200,000 to 800,000 bbl. portland cement, Spec. 80, for Colorado River Aqueduct. Est. $350,000 to $1,200,000. Noted Nov. 1.

VENTURI METER—**San Francisco, Calif.**—Nov. 23, by T. A. Brooks, city purch. agt., 1 Venturi Meter under P.W.A. provisions, for city and San Francisco Co.

CEMENT, etc.—**Lyons, Ill.**—Nov. 13, by Dpt. P. Wks. & Buildings, Div. Hys., 400 bbl. cement; 375 tons coarse aggregate; 187 tons sand; 500 sq.ft. ½ in. bituminous expansion joint; 500 each precast segmental concrete block; 1 each frame and closed lid; 4 each frame and open lids; 20 lin.ft. 8 in. vitr. tile pipe; 500 lb. ½ in. round deformed reinforcing bars for Sects. 1, 2 and 3 Cs. G. H. Baker, engr. co. roads and city streets.

†DERRICK BOAT—**Buffalo, N. Y.**—Nov. 21, by U. S. Eng., constructing and delivering afloat one 25 ton whirler derrick boat at U. S. Engineer Wharf, foot East 9th St., Cleveland, O.

†BUOYS—**St. George, N. Y.**—Nov. 12, by Superintendent Lighthouses, 363 special class steel plate buoys of welded construction, each with steel bottom casting.

†BUOY SWIVELS and SHACKLES, etc. —**St. George, N. Y.**—Nov. 15, by Superintendent Lighthouses, Staten Island, 120 wrought iron buoy swivals, 1,000 wrought steel buoy shackles and riveted pins, 7,000 steel buoy shackles with split keys.

†GAS BUOYS—**St. George, N. Y.**—Nov. 14, by Superintendent Lighthouses, St. George, 5 gas buoys.

†GENERATOR—**Knoxville, Tenn.**—Dec. 3, by Tennessee Valley Authority, Knoxville, furnishing, installing two 56,000 kva. vertical shaft alternating current generators for Norris Power Plant and one 36,000 kva. vertical shaft alternating current generator for Wheeler Power plant.

CONTRACTS AWARDED

ASPHALTIC CONCRETE—**Alhambra, Calif.**—City Comn., furnishing, delivering on job 6,500 tons asphaltic concrete for repaving Alhambra Rd., from Atlantic Blvd. to east city limits, to Geo. R. Curtis Paving Co., 2440 East 26th St., Los Angeles, approximately $12,000. Bids Oct. 16, awarded Oct. 23.

BELT CONVEYOR EQUIPMENT—**Los Angeles, Calif.**—S. A. Joseph, purch. agt., Metropolitan Water Dist., 306 West 3rd St., furnishing all material and equipment for four 20 in. belt conveyors, Spec. E-123, revised, furnishing all materials and equipment for two 16 in. belt conveyors, Spec. E-128, revised, for Colorado River Aqueduct, to Stephens-Adamson Mfg. Co., 1227 East 37th St., $4,540. Bids Oct. 1.

FIBER CONDUIT—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 south Bway., 35,000 ft. 2½ in. straight, fifty 90 degree and one hundred 45 degree conduit bends, Spec. 1531, to Westinghouse Electric Supply Co., 905 East 2nd St., $3,383. Bids Oct. 22, awarded Oct. 30.

FIRE HOSE—**Eureka, Calif.**—City Council, 1,050 ft. 2½ in. double jacket fire hose with couplings, to B. F. Goodrich Co., 355 Brannan st., San Francisco (White King type), at $1.20 per ft. Bids Oct. 16, awarded Oct. 25.

SULPHATE OF COPPER—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing, delivering 130 tons commercial sulphate of copper, small crystals in 450 lb. bbls., to Los Angeles Chemical Co., 1960 Santa Fe Ave., $10,114. Bids Oct. 5, awarded Oct. 30.

TRANSFORMERS—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Bway., furnishing, delivering outdoor, oil-insulated, self-cooled station type distribution transformers, three 500 KVA, 34,500 volt, three 200 KVA, 34,500 volt, to Maloney Electric Co., 124 West 4th St., $9,491. Bids Oct. 9, awarded Oct. 25. Noted Sept. 27.

SAND, CEMENT, etc.—**Modesto, Calif.**—C. S. Abbott, secy. Modesto Irrigation Dist., 3,530 cu.yd. sand, 2,835 cu.yd. sand and 1,730 cu.yd. rock delivered at 6 sections of district, to A. O. Kauffman, Modesto, $5,710, furnishing, delivering 18,000 bbl. cement at Modesto and Waterford to Yosemite Cement Co., Merced, $30,040. Award subject to P.W.A. approval. **P.W.A.**

CAST IRON SPECIALS—**San Francisco, Calif.**—T. A. Brooks, city purch. agt., City Hall, furnishing c.i. and cast steel specials, Bid 1260, to Enterprise Fdry. Co., 2902 19th St., $71,076. Bids Oct. 5, awarded Oct. 30. Noted Sept. 27.

FIRE HOSE—**San Francisco, Calif.**—A. T. Brooks, city purch. agt., 20,000 ft. 2½ in. and 4,000 ft. 3½ in. cotton rubber lined fire hose, Bid 1272, to Pioneer Rubber Mills, 353 Sacramento St., $1.25 and $1.60 per ft. respectively. Bids Sept. 28.

SEWER PIPE, etc. — **Swampscott, Mass.** — Town Water & Sewer Bd., Town Hall, 720 ft. 15 in. vitr. clay sewer pipe, tees and bends, to Lynn Supply Co., 80 State St., Lynn, $1,684. Bids Oct. 29, awarded Oct. 30.

SPECIAL CASTINGS—**Minneapolis, Minn.**—City, 12½ tons special castings for Water Dpt., to Diamond Iron Wks., 2nd St. and 18th Ave. N., $1,595. Bids Oct. 22.

†LUMBER, etc. — **Vicksburg, Miss.** — U. S. Eng., P. O. Box 667, 9,000 ft. cypress flooring, to E. L. Weissinger, Cary, $1,575•••60 steel castings, to Standard Brake Shoe & Fdry. Co., Pine Bluff, Ark., $1,398•••75 gate valves, 225 globe valves and 60 angle valves, to Weil-Gutman Supply Co., 427 Peters St., New Orleans, La., $1,067•••15,000 bd. measure cypress or long leaf Southern yellow pine lumber, to Burdette Lumber Co., Meridian, Miss., $377••• crawler type tractor, equipped with Bull Dozer, to Allis Chalmers Mfg. Co., 1126 South 70th St., Milwaukee, Wis., $3,105. Grand total $7,523. Bids Oct. 6, 8 and 16.

†CEMENT—**Knoxville, Tenn.**—Tennessee Valley Authority, Knoxville, 360,000 bbl. cement, to Volunteer Portland Cement Co., 502 South Gay St., Knoxville•••150,000 bbl., to Signal Mountain Cement Co., Volunteer Bldg., Chattanooga, both delivered at Norris Dam at $1.7384 per bbl.•••80,000 bbl., to Penn. Dixie Cement Co., James Bldg., Chattanooga•••130,000 bbl., to Lone Star Portland Cement Co., Comer Bldg., Birmingham, Ala.; 50,000 bbl., to Cumberland Portland Cement Co., Cowan•••75,000 bbl., to Hermitage Cement Co., Nashville•••80,000 bbl., to Lehigh Portland Cement Co., Allentown, Pa. •••75,000 bbl., to Marquette Cement Co., 8501 Vernon Ave., Chicago, Ill.•••130,000 bbl., to Universal Atlas Cement Co., 208 South LaSalle St., Chicago, Ill.•••80,000 bbl., to Alpha Portland Cement Co., Webb Crawford Bldg., Birmingham, Ala., all to Wheeler Dam at $1.8798 per bbl. Bids Oct. 15. Noted Sept. 27.

TURBO-GENERATOR, etc.—**Manitowoc, Wis.**—Public Utilities Comn., 5,000 kw. steam turbo-generator, condenser and auxiliary equipment, to Allis-Chalmers Mfg. Co., 1126 South 70th St., Milwaukee, $140,910. Bids Sept. 27. Noted Sept. 13.

SHEET PILING—**Milwaukee, Wis.**—Sewerage Comn., used steel sheet piling, to L. B. Foster Co., 231 South LaSalle St., Chicago, Ill., $0,509. Bids Oct. 18, awarded Oct. 29.

FOREIGN

Brazil, Rio de Janeiro—James Magnus & Cia, Rua Sao Pedro 96, interested in prices of dredging equipment, suction type, custom duty 0.207 milreis up to 2,046 milreis per kilo according to weight; also interested in prices of locomotives and railway equipment. Custom duty free.

Denmark, Copenhagen—Petersen & Albeck, Enghave Brygge, in market for ferrous and non-ferrous scrap metals. Codes Bentley's A.B.C. 6th.

Egypt, Cairo—Nov. 22, by Director General Mechanical & Electrical Dpt. Ministry of P. Wks., supplying, constructing and erecting El Khanka Mental Hospital Power and Pumping Station.

England, London—Post Office Dpt. soon takes bids underground cable construction between Liverpool and London, Gloucester and Oxford, 200 circuits and 200 new automatic exchanges •••**Newcartes on Tyne,** City Engineer preparing plans for vertical lift bridge, $4,580,000••• **Gillingham** Town Engineer preparing plans town hall, $425,000 voted•••C. J. Campbell, 1 Arundel Rd., **Littlehampton,** in market for second hand self contained grab dredging plant.

India—Agent East Indian Railway, 105 Clive St., **Calcutta,** in market for supply of locomotive boilers and superheater conversion of 0-6-0 class and supplying locomotive cylinders and motion parts for superheater conversion of 0-6-0 and 2-6-4 Class•••Controller of Stores, Bengal Nagpur Railway, Kidderpore, **Calcutta,** interested in prices belting, M.S. bolts, nuts, rivets, and washers, cotters and split pins, vacuum brake fittings such as clips, hosepipes, rings and washers•••Stores Purchase Committee of Government of Mysore, **Bangalore,** in the market for supply of liquid chlorine, for several waterworks in state•••Deputy Executive Officer of City of **Calcutta,** interested in prices of vertically cast 12 in. diam. cast iron pipes.

Irish Free State—County Board of Health, **Meath,** takes bids in November, hospital addition, $350,000. **Sligo** Hospital Bd. awards contract for hospital addition, to G. and T. Crampton, Dublin, $427,705.

Finland, Helsingfors—E. Aegmelaeus, 60 S. Runebergsgatan, wants prices on pulp and paper mill machinery.

Norway, Oslo—Seel & Gurholt A/s K. Johansgate 41, in market for machinery for mines, pulp and paper mills. Custom duty 10 per cent of value.

Singapore—Municipality voted $8,000,000 for sewage scheme to extend over a period of 4 years.

PUBLIC BUILDINGS

PROPOSED WORK

Calif., San Bernardino—San Bernardino Valley Junior College Dist., defeated $268,000 election for school. They have a government grant of $105,000 for construction of 3 junior college buildings. G. S. Wilson, Mission Inn, Riverside, archt. Noted Sept. 27.

Calif., Santa Barbara—City defeated $320,000 civic auditorium. Edwards & Plunkett, 114 East De la Guerra St., archts. Noted Oct. 4.

Calif., Watts—Municipal Housing Comn., D. Tyler, secy., 417 South Hill St., Los Angeles, applied to P.W.A. for $1,500,000 loan to finance construction of 380 residences on Ramsay property.

Mo., Kansas City—Bd. Educ. soon takes bids for Lincoln High School, 3 story, basement, 182x259 ft., brick, 21st and Woodland Sts., $700,000. C. A. Smith, 800 Finance Bldg., archt. Noted June 7.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Jefferson Ave. extension and Concord St., construction addition to P. S. 110, 124 Monitor St., $250,000. P.W.A. funds allotted.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, plans staff house, Kings County Hospital, 451 Clarkson St., $50,000. S. S. Goldwater, comr. in charge.

Tenn., Chattanooga—Hamilton Co., A. E. Rickin, supt. Schools, appointed committee headed by Squire C. E. Camp, chn., to apply to P.W.A. for loan and grant of $997,500 for new school buildings and repairs to old ones as follows: Soddy-Daisy Cons. High School, $120,000; Hixson, $110,000; White Oak Junior High, $125,000; Central High School, $200,000; Silverdale-Tyner Cons. School additions, $108,000; library at Tyner, $52,000; auditorium at Falconia, $30,000; 2 rooms at Edward's Point, $5,000; 8 class-rooms and auditorium at Ganns, $30,000; auditorium and gymnasium at Sale Creek, $15,000; auditorium at Anna B. Lacey School, $15,000; auditorium and library at East Side, $15,000; auditorium at Ooltawah High School, $28,000; 4 classrooms at Ooltawah Grammar School, $22,000; auditorium at White Oak, $22,000; addition to Red Bank Junior High School, $20,000; addition to Mountain Creek School, $20,000; addition to Apison School, $7,500; 8 room addition to Pineville School, $30,000; equipment for various schools, $25,000. Work to start as soon as money is available. Noted Sept. 7, 1933.

†Tex., San Antonio—U. S. Eng., Wash., D. C., plans 9 story, basement hospital, at Arcadia Heights, $1,933,468. Foundation contract to be let early in December.

BIDS ASKED

Calif., Long Beach—Nov. 21, by Bd. Educ., constructing Buildings B, D, F at Alexander Hamilton Junior High School. Est. $260,000. Schilling & Schilling, 145 Linden Ave., archts. Noted June 7.

†Colo., Rocky Ford—Nov. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†D. C., Wash.—Nov. 13, by U. S. Eng., 16th Navy Bldg., Wash., D. C., constructing brick steel temporary addition to munitions building.

†Ind., Crown Point—Nov. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Ind., Culver—Nov. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Mass., Hingham—See "Contracts Awarded."

Mass., Norfolk—Nov. 14; by Commonwealth of Massachusetts, Dpt. Health, State House, Boston, furnishing refrigeration equipment and frigeration insulation, finish hardware, elevator car and elevator entrances at Pondville State Hospital, Stevens, Curtin & Mason, 45 Newbury St., Boston, engrs.

†Mich., Fremont—Nov. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Mo., St. Louis—Public Wks. Branch, Procurement Div., Treas. Dpt. at office Sup. Archt., Wash., D. C., bids about Jan. 1, superstructure 2 and 3 story, basement, sub-basement, 330x497 ft., rein.-con., brick, steel U. S. Post Office, Clark Ave., Market, Moore, 17th and 18th Sts., incl. tunnel under 18th St. to connect with Union Station, $4,000,000. W. J. Knight & Co., 901 Wainwright Bldg., engrs. Klipstein & Rathman, 316 North 8th St., archts. Noted Oct. 25, under "Contracts Awarded."

†N. J., Westwood—Nov. 19, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†N. Y., Haverstraw—Nov. 22, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

N. Y., Utica—Nov. 13, by Bd. Educ., general contract 4 and 5 story, 180x200 ft., brick, stone school, plain found., Hilton Ave. Barg & Newkirk, U. G. and E. Bldg., Utica, engrs. and archts.

†N. C., Shelby—Nov. 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending and remodeling U. S. Post Office.

†O., Orrville—Nov. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Tenn., Knoxville—Nov. 20, by Dpt. Agriculture, Director of Purchases, Wash., D. C., constructing corn and cotton laboratory at University of Tennessee grounds.

†Tenn., Trenton—Nov. 20, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Sept. 6.

Tex., Denton—Nov. 20, by President Texas State College for Women, 4 story, brick, stone senior dormitory and infirmary, $220,000. P.W.A. project. S. Simons, Citizens Bank Bldg., Tyler, engr. Noted May 31.

†Va., Richmond—Nov. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing

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†Federal Government

Public Buildings (Continued)

parcel post building. Noted Apr. 12.

†**Wash., Nestelem**—Nov. 22, by Dpt. Interior, 2 story, basement, brick, steel hospital, $180,000, Schmidt, Garden & Erickson, 104 South Michigan Ave., Chicago, Ill., archts.

†**Wyoming**—Dec. 17, by National Park Service, Dpt. Interior, Yellowstone Park, constructing 2 buildings at Mammoth Hot Springs, Yellowstone Natl. Park.

CONTRACTS AWARDED

Calif., San Francisco—S. J. Hester, secy. Dpt. P. Wks., City Hall, general contract 6 story cancer building and 5 story psychopathic building, Potrero Ave., to Anderson & Ringrose, 329 Market St., $546,732***electrical work, to C. A. Langlais, 472 Tehama St., $34,458***mechanical equipment and plumbing, to F. W. Snook, 596 Clay St., $87,584. Grand total $668,774. Bids Oct. 24, awarded Oct. 29. Noted Oct. 4.

†**Calif., Yosemite** — National Park Service, electrical work for 1 and 2 story, 70x260 ft., reinforced concrete utility building, to Eddy Electric Co., 309 East Weber Ave., Stockton. Noted Nov. 1, under "Contracts Awarded."

Mass., Boston—City, Dpt. School Buildings, W. W. Drummey, supt. of construction, 11 Beacon St., 3 story, basement, 61x120 ft., brick, concrete, stone elementary school, Beethoven Dist., on Baker, Ansonia and Cambria Sts., West Roxbury, to Carilli Constr. Co., 7 Water St., Boston, $137,393. Bids Oct. 10, awarded Oct. 25.

Mass., Dracut—Town, J. E. Daigle, chn. Building Comn., Town Hall, excavating for 2 story, basement, 50x130 ft. brick school addition, Greenmont Ave., to A. Mailloux, Broadway*** electrical work, to Derby Electric Motors Co., 40 Middle St., Lowell***heating, to Chisholm Plumbing and Heating Co., 373 Westford St., Lowell***steel insp., to E. C. Magoun, 320 Park Ave., Arlington***steel and iron, to Lowell Iron & Steel Co., Tanner St., Lowell. Noted Oct. 25, under "Contracts Awarded."

†**Mass., Hingham**—Yards & Docks, Navy Dpt., Wash., D. C., boilers and insulation of elevated tanks, Spec. 7750, at U. S. Naval Ammunition Depot, by own forces. Former bids rejected.

Mass., Palmer—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, general contract 1 story, basement, 73x185 ft., kitchen, dining and bakery building at Monson State Hospital, to J. G. Roy & Sons, 21 Silver St., Springfield, $122,163***plumbing, to T. J. Conway, 77 Winter St., Springfield, $17,441***heating and ventilating, to Holyoke Valve & Hydrant Co., 150 Race St., Springfield, $23,580***electrical work, to Brady Electric Co., 236 Bedford St., Fall River, $15,800. Grand total $178,984. **P.W.A.** Bids Sept. 5, awarded Oct. 31. Noted Jan. 4.

N. Y., Dannemora—Commissioner Correction, State Office Bldg., Albany, test borings for Cell Block E, Clinton Prison, to Battle Bros., 315 Genet St., Scranton, Pa.

N. Y., Hammondsport — Bd. Educ., general contract school, to G. S. Irish, 102 Benedict St., Syracuse. Est. $120,000. **P.W.A.**

N. Y., Hunter—Bd. Educ., general contract school, to G. S. Irish, 102 Benedict St., Syracuse, $141,500. **P.W.A.** Bids Oct. 1, awarded Oct. 25. Noted Oct. 18.

N. Y., Tannersville—Central School Bd., general contract school, to LaSala Mason Corp., 51 East 42nd St., New York, $196,000; heating, to Johnson Heating Co., 306 East 26th St., New York, $31,475***plumbing, to Fox Plumbing Co., 103 Park Ave., New York, $16,055*** electrical work, to E. A. Bingel, Cairo, $16,360. Grand total $259,890. Bids Oct. 1. Noted Sept. 27.

N. Y., Hempstead—Town, general contract high school, to J. J. Dixon Constr. Co., Nassau Rd., Roosevelt, about $154,000. **P.W.A.** Bids Oct. 11. Noted Aug. 2.

N. Y., Ithaca—Dpt. Health, State Office Bldg., Albany, completing sanitary work at Herman M. Biggs Hospital, to Jarcho Bros., 215 East 37th St., New York, $39,000. Bids Sept. 6. Noted Aug. 23.

N. Y., Leonardsville—Bd. Educ., general contract school, to E. C. Richards & Son, 248 Elizabeth St., Utica, $82,978***heating and ventilating, to Hamline Co., Inc., 529 Oriskany St., Utica, $15,954***plumbing, to J. T. Williams, 1637 West St., Utica, $7,355***electrical work, to F. Handlin, 1621 Bellevue Ave., Syracuse, $5,797***painting, to J. H. Hauser, 525 Court St., Utica, $2,645. Grand total $114,729. **P.W.A.** Bids Sept. 7.

†**N. Y., New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., furnishing, installing electrically operated exterior doors, to Irving Iron Wks. Co. and Allen Drew Co., 50 27th St., Long Island City, $104,900. Bids Oct. 19. Noted Oct. 11.

N. Y., Ramapo—Bd. Educ., oil burner for school, to Warsfold & Hawvermale, Inc., Main and Franklin Sts., Nyack, $796. **P.W.A.**

N. Y., Westbury—Bd. Educ., plumbing for school, to H. Barrow, Inc., 221 Buffalo Ave., Brooklyn, $14,465. **P.W.A.** Bids July 30. Noted July 26.

N. D., Grafton—Bd. Educ., general contract 2 story, basement, 131x207 ft., brick, steel school addition, to Redlinger & Hansen, 332 Sexton Bldg., Minneapolis, Minn., $102,403*** plumbing and heating, to R. L. Anderson, 519 Cleveland Ave. N., St. Paul, Minn., $23,903*** wiring, to Commonwealth Electric Co., 418 Bway., St. Paul, Minn., $3,788. Grand total $130,094. **P.W.A.** Bids Oct. 19.

O., Cleveland—Bd. Trustees Huron Road Hospital, kitchen equipment for hospital, to Albert Pick Co., 1200 West 35th St., Chicago, Ill., $19,291***sterilizing equipment, to Scanlon-Morris Co., Madison, Wis., $12,493***laundry equipment, to American Laundry Mchy. Co., Ross and Section Aves., Norwood, Cincinnati, $16,406. Grand total $48,190. **P.W.A.**

Wis., Loyal—See "Proposed Work."

†**Tex., Fort Worth**—Treas. Dpt. at office Sup. Archt., Wash., D. C., grading at Narcotic Farm, to C. A. and J. W. Vilbig, Jr., 817 Bourbon St., Dallas, $39,500. Noted Aug. 16.

COMMERCIAL BUILDINGS

PROPOSED WORK

N. Y., New York—Handy & Schloss, 285 Madison Ave., will not alter heating and plumbing in 6 story apartment, 601 Cathedral Parkway, $35,000. Project indefinitely deferred. Noted Oct. 25.

BIDS ASKED

Ind., Rochester—M. E. Leekron taking bids altering hospital, requiring diet rooms, nursery, operating room, solarium, incl. elevator, plumbing, electric wiring, floors, exhaust fan, ventilator, rolling steel doors, steel stairs, wrought iron railings, steam heating, $50,000. A. M. Church, Cherubusco, R.R. 3, engr.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Brooklyn—Williamsburg Savings Bank, 175 Bway., taking bids general and separate contracts altering heating, plumbing, etc., for 4 story apartment, Greenpoint and Manhattan Aves., $28,000. I. Prowler, 367 Fulton St., archt. Noted Nov. 1.

CONTRACTS AWARDED

La., New Orleans—L. S. Weil & W. Moses, engrs., 427 South Peters St., installing refrigerating and air conditioning in 14 story Whitney Bank Building, St. Charles and Gravier Sts., to Carrier Eng. Co., Hibernia Bank Bldg., for Whitney Natl. Bank. Bids Sept. 24.

N. Y., Brooklyn—S. Glasterstein, 50 Court St., 6 story, brick apartment, Ocean Parkway and Webster Ave., separate contracts, $125,000. Owner taking bids. Noted Nov. 1.

N. Y., Brooklyn—H. Lefrack, 897 Empire Blvd., 6 story, 90x120 ft. apartment, 14th Ave. and 50th St., separate contracts, $200,000. Kavy & Kavovitt, 16 Court St., archts.

N. Y., New York—Four Hundred Five East 72nd St., 6 story apartment, 411 East 72nd St., separate contracts, $125,000. Boak & Paris, 101 Park Ave., archts. Noted Oct. 25.

N. Y., New York—Manhattan General Hospital, 161 East 90th St., hospital, 149 East 90th St., to Louis Adler, 1450 Bway. Est. $500,000. **Maturity after Mar. 1.** Noted Oct. 25.

N. Y., New York—Provident Loan Society of New York, general contract boiler room, etc., 21 East 47th St., to C. T. Wills Constr. Co., 286 5th Ave. Est. $36,000. Noted Oct. 25.

N. Y., New York—West Side Savings Bank, 6th Ave. and 9th St., altering heating, plumbing in apartment, 320 Manhattan Ave., to W. V. Kiehnle, 3606 Park Ave. Est. $30,000. Noted Aug. 9.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Colo., Aspen—FLOTATION MILL—Colorado-Duluth Mining Co., plans large flotation mill.

Fla., Arcadia—PACKING PLANT, etc.—D. H. Browder & Sons, Arcadia, plans rebuilding packing and distribution plant addition.

Ind., Indianapolis—PLANT—Safety Air Transportation Co., c/o A. Williams, 814 West 25th St., plans plant, Allisonville Rd. Est. about $40,000. **Maturity indefinite.**

Md., Baltimore—L. R. White, Jr., archt., 10 West Chase St., soon lets contract 1 story, 80x300 ft. cork storage shed and breaker house, and 4 story, 50x130 ft. Building 46B, Eastern Ave. and Kresson St., for Crown Cork & Seal Co., Eastern Ave. and Kresson St. $50,000.

Mass., West Springfield — TERMINAL — Sinclair Refining Co., 671 Memorial Ave., making plans 2 story, 25x30 ft., 1 story, 15x30 ft., and 1 story 25x100 ft., brick terminal, incl. office, warehouse, pumphouse and steel tanks, $35,000. Private plans.

Neb., Omaha—PLANT—Lewis Packing Co., Omaha, purchased vacant Higgins Packing Co. building at 36th and L Sts. and will repair and remodel and put in large amount of new equipment. $75,000.

N. J., Kearny—TERMINAL YARD, etc.—Lincoln Terminal Corp., Lincoln Hy., plans altering and repairing terminal yard and storage. $28,000 with equipment. Architect not appointed.

N. Y., New York—STORAGE—Mack Truck Corp., lessee, 25 Bway., soon takes bids storage building 604 West 43rd St., for E. Higgins, 50 Union Square. $120,000. A. Hodges, c/o lessee (Eng. Dpt.) engr. and archt., preparing plans. Noted Oct. 25.

W. Va., Wheeling—FACTORY—Hazel-Atlas Glass Co. rejected bids altering plant, 19th and Jacobs Sts. To exceed $28,500. Will readvertise in January. F. Faris, 1117 Chapline St., engr. and archt. Noted Oct. 11.

Wis., Sheboygan — DAIRY PLANT — Modern Dairy Co-Op., 2715 North 15th St., plans by Satre & Senescall, 1232 North 7th St., dairy plant. $50,000.

P. E. I., Charlottetown—MILLS—Wm. Condon Co., plans repairing woolen mills damaged by fire. $28,000 or more. Architect not appointed.

CONTRACTS AWARDED

Calif., Santa Cruz—TANNERY—Salz Tanner Co., Santa Cruz, 2 story, 105x175 ft., frame, heavy timber, to J. J. Irwin, 1040 Oak St., San Francisco, cost plus basis. Awarded Oct. 27.

Mass., Attleboro—FACTORY—General Plate Co., R. Willard, genl. mgr., Foster St., 2 story, basement, brick, steel factory addition, concrete foundation, 10,000 sq.ft. floor space, Foster St., to Rowley Constr. Co., 260 Central Ave., Pawtucket, R. I. To exceed $28,500. Private plans.

Mass., Lynn—GARAGE—Eastern Mass. Street Railway Co., 38 Chauncy St., Boston, reinforcing steel for 1 story, basement, brick, steel bus garage, to Barker Steel Co., 25 Water St., Somerville***steel sash, to Campbell Metal Window Co., 73 Tremont St., Boston***overhead doors, to Overhead Door Sales Co., Inc., 74 Needham St., Newton***steel, to New England Structural Steel Co., 310 2nd St., Everett. Noted Oct. 11, under "Contracts Awarded."

Mass., Watertown—CAR HOUSE—Boston Elevated Railway Co., 31 St. James Ave., Boston, 1 story, 14x190 ft., brick, structural steel car house addition, concrete found., Galen and Water Sts., to Frankini Constr. Co., 30 Mystic Ave., Medford. Private plans. Awarded Oct. 29.

Mass., Woburn—WAREHOUSE, etc.—H. M. Rambach, c/o Eisenberg & Feer, archts., 11 Beacon St., Boston, 1 story, basement, 40x100 ft., brick, cast stone warehouse and store, to Platt Constr. Co., 10 Tremont St., Boston. Est. exceeds $28,500. W. T. Grant Co., 1441 Bway., New York, lessee. Noted Oct. 25.

Minn., Minneapolis — BOILER HOUSE — Fleischmann Co., 1700 Northeast 2nd St. boiler house addition, 3 boilers and 1,500,000 bu. storage addition, separate contracts awarded. To exceed $100,000.

Mo., Kansas City—ASSEMBLY—Chevrolet Motor Co., General Motors Bldg., Detroit, Mich., general contract altering and constructing brick, concrete, steel automobile assembly plant addition, plain found., to S. Patti Constr. Co., Finance Bldg. Est. about $50,000.

Mo., St. Louis—BREWERY STOCK HOUSE—Anheuser-Busch, Inc., 721 Pestalozzi St., general contract 1 story top addition to 5 story brewery stock house, 1006 Pestalozzi St., to C. G. Saenger Building & Constr. Co., 3450 Minnesota Ave. Est. $50,000.

Mo., St. Louis—PACKING PLANT—Laclede Packing Co., 1701 North Prairie Ave., general contract 1 story, 26x39 ft. packing plant addition, Cote Brilliante and Prairie Aves., to Herklotz & Herchert Contg. Co., 3023 Pestalozzi St., St. Louis; excavating, to Mills Drayage Co., 2817 Easton Ave. C. A. Koerner, 1601 Syndicate Trust Bldg., engr.

N. Y., Brooklyn—STORAGE—Franklin Kent Corp., Franklin and Park Aves., 2 story, brick addition, Franklin and Park Aves., to S. A. Regan, 1008 East 4th St., Brooklyn. Est. $28,000. Noted Nov. 1.

N. Y., Brooklyn—STORAGE—Tannin Corp., 500 5th Ave., New York, 1 story storage, Huron and Freeman Sts., to Weyerhauser Corp., c/o A. McNulty, 51 East 42nd St., New York. Est. $50,000. Noted Nov. 1.

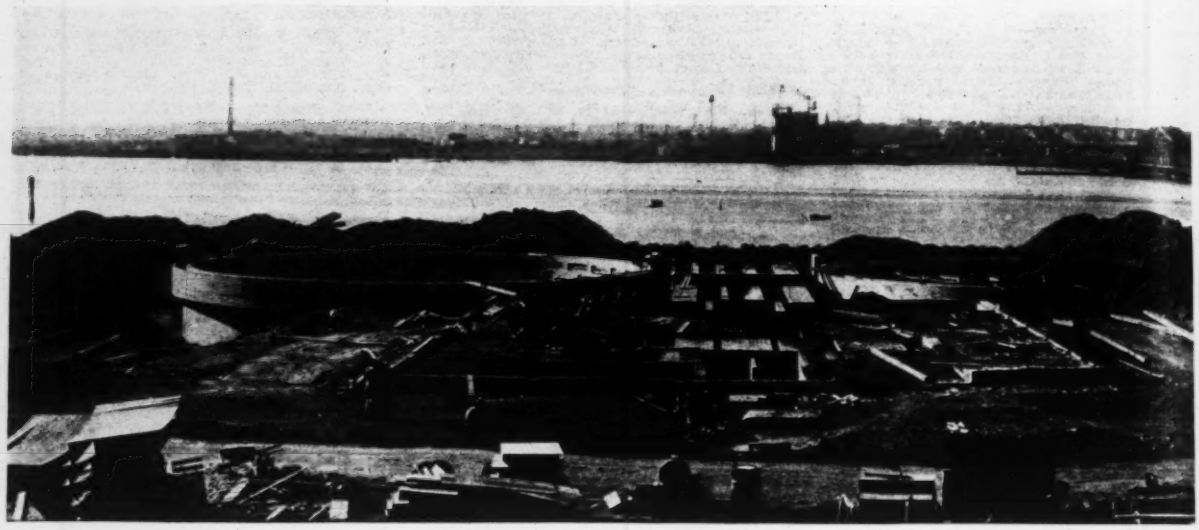
N. Y., Flushing—STABLE and WAGON ROOM—Sheffield Farms, 524 West 57th St., New York, stable and wagon room, Flushing Ave. and Sophie St., to F. Droesch, 110-08 Jamaica Ave., Richmond Hill. Est. $35,000. Noted Aug. 16.

N. C., Burlington—MILL—John R. Morton & Co., 2 story, basement, silk manufacturing plant, 36,000 ft. floor space, to C. M. Guest & Son, Anderson, S. C., $200,000. Bids Oct. 16. Noted Oct. 25.

Wis., Green Bay—PLANT—Fort Howard Paper Co., plant addition, to Selmer & Co., Green Bay. Est. $60,000.

Progress at Perth Amboy

P. W. A. JOB DOCKET 1748



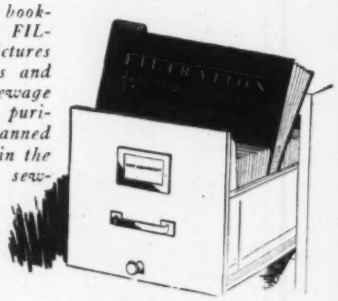
EVERY week inquiries as to how the new sewage plant at Perth Amboy is progressing, evidence the keen interest of the profession in this modern disposal process. • The photograph above was taken October 20, 1934. In the two large circular tanks will be installed the Laughlin Magnetite Filters. • The outlet weirs may be seen just below the inner rims of the tanks . . . also the building foundations, showing the screen chamber and floccing channels. • The steel for the building is now being erected, and the installation of equipment begins about November 15. • The work has been inspected with great interest by visiting engineers and officials.

Modern Chemical-Mechanical Treatment

This plant will have a capacity of 10 m.g.d. average—20 m.g.d. maximum. It is designed to effect complete disposal of sewage by furnishing a clear, sparkling effluent, sterilized with chlorine . . . and destruction of sludge by incineration. • You may recall that Perth Amboy's disposal problem involves sewage from a population of 50,000 . . . and industrial wastes from ten sizeable plants.

• Consulting Engineer: Louis P. Booz, Perth Amboy, New Jersey.

Our new two-color 9" x 12" booklet: FILTRATION and FILTERS tells about and pictures our various types of filters and dewaterers employed in sewage treatment and water supply purification. • This booklet is planned to fit your file. It belongs in the reference library of every sewage and water works official and consulting engineer. • It will be a pleasure to send you a copy . . . without obligation, of course.



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